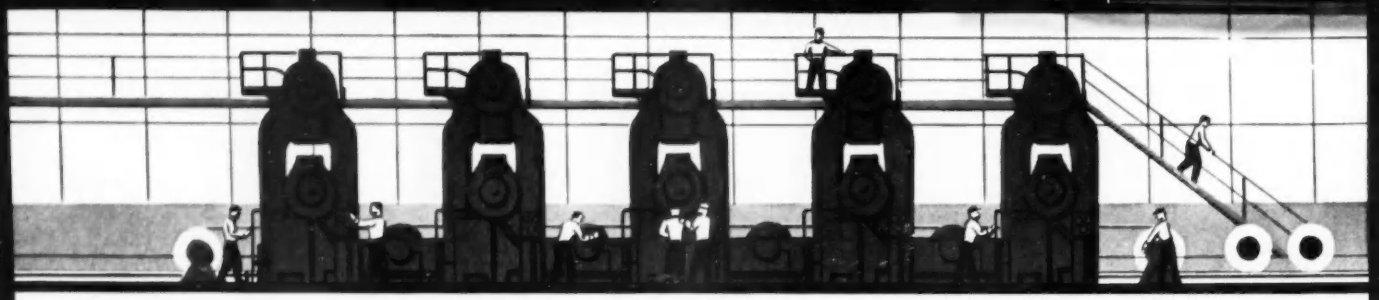
AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JUNE 1, 1954

In This Issue

A CHILTON PUBLICATION



Now! cut application costs and grease inventories with

NEW STANOLITH GREASE MP

You need only this *one* grease for many kinds of heavy equipment!

Added high-load carrying capacity!

Resists both water and high temperatures!

Here is a newly formulated grease with such an increase in multi-purpose range that it helps you *cut application costs* and *reduce grease inventories*. Higher oil viscosity and greater extreme pressure properties make it suited for wide use in steel mills, cement mills, rubber mills, mining operations—all other heavy equipment industries.

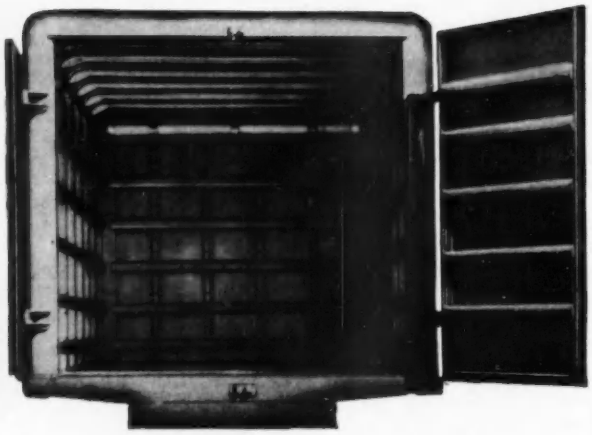
More than just an "E. P." grease, New STANOLITH MP has all of the outstanding properties of STANOLITH greases: excellent oxidation stability and good mechanical stability. It has extreme water resistance and withstands high temperatures—*it will not thin out*. For better protection of all kinds of heavy equipment, under a wide range of conditions, use STANOLITH Grease MP.

New STANOLITH Grease MP takes its place with famous STANOLITH Greases No. 42 and No. 57 to give you the most versatile collection of multi-purpose greases in modern industry.

STANDARD OIL COMPANY *(Indiana)*

Call your nearby Standard Oil lubrication specialist and let him show you how Standard's "multi-purpose" greases can save you money and help you avoid trouble.

STANDARD



A great advance . . . permitting flexibility in design, and the reduction of deadweight . . . is made possible by utilizing Parish interchangeable sections of light gage Mayari R, such as you see inside this truck body.

1001 combinations

with interchangeable ready-made sections

simplify lightweight body design

TRUCK-BODY BUILDERS can now design their own lightweight body skeletons to meet practically any requirement.

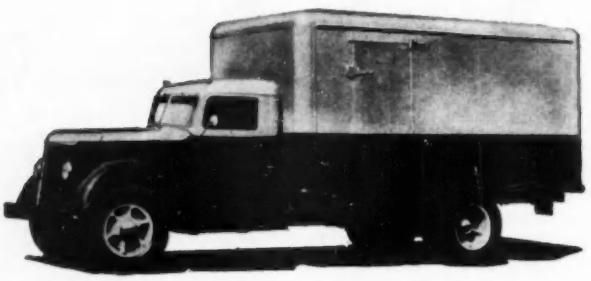
It's an advance made possible by the Parish Pressed Steel Company of Reading, Pa. For Parish developed *interchangeable preformed sections* . . . using Mayari R, a high strength, low alloy steel containing nickel, produced by Bethlehem Steel Company, Bethlehem, Pa.

Steels of this type permit you to make substantial weight reductions, because thin, light sections provide the same strength and safety as thicker, heavier sections of plain carbon steel.

Furthermore, high strength, low alloy steels containing nickel respond to fabrication, including welding and cold-forming, better than does any carbon steel of equal strength. And they also offer greater resistance to impact, wear, and abrasion, thus extending the life of a truck body subjected to hard usage.

In addition, the nickel alloy steels show superior resistance to atmospheric and many other types of corrosion, thereby providing another big advantage to users.

Produced under a variety of trade names by leading steel companies, low alloy, high strength steels containing nickel along with other alloying elements have wide application in the automotive and many other fields.



Completed body, built with preformed interchangeable sections, not only meets specific needs of the buyer, but weighs less because superior properties of the nickel alloyed steel allow use of lighter gage.

Consult us on their use in your products or equipment. Investigate how you can cut needless weight, yet increase the payload capacity of your vehicles. Write us today for your copy of the publication "High-Strength Low-Alloy Steels."

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

JUNE 1, 1954 VOL. 110, NO. 11

FEATURES

NEWS PREVIEWS

DEPARTMENTS

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

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SLUDGE? NO
RUST? NO
FOAM? NO

WHEN YOUR hydraulic medium is *Texaco Regal Oil R&O*, you've got the world's finest protection against rust, sludge and foam. As one user (name on request) says, after years of using it —

"I have yet to see one of our units in which *Texaco Regal Oil R&O* has been used that wasn't clean, free from rust and sludge — with pump parts, piping, controls all in A-1 condition."

Tests prove that *Texaco Regal Oil R&O has more than ten times the oxidation resistance* of ordinary turbine-quality hydraulic oil. It is far superior in preventing sludge, rust and foam. There is a complete line of *Texaco Regal Oils R&O* to meet every hydraulic requirement.

A Texaco Lubrication Engineer will gladly work with you to increase efficiency and reduce costs throughout your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

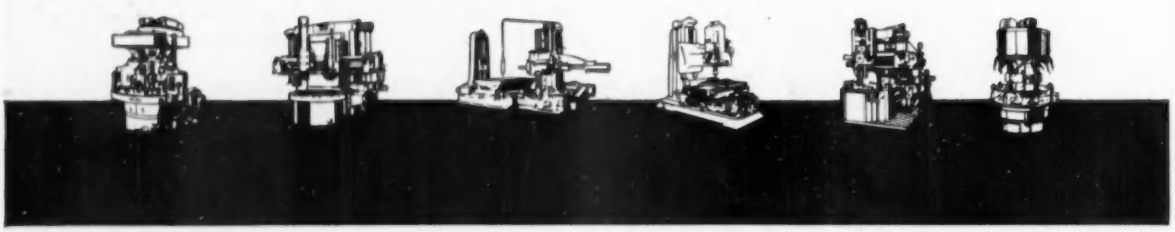
FOR ALL HYDRAULIC UNITS

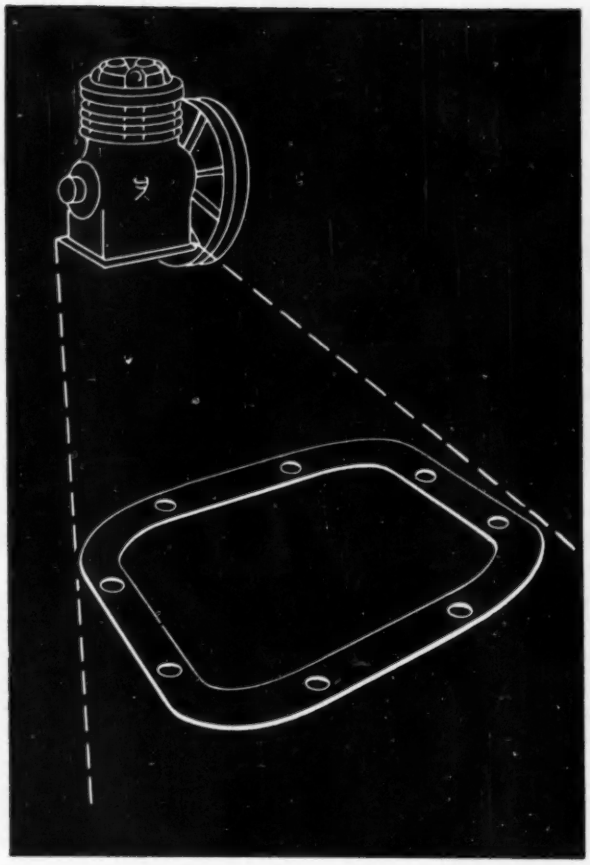
where *Endurance and Accuracy* count . . .

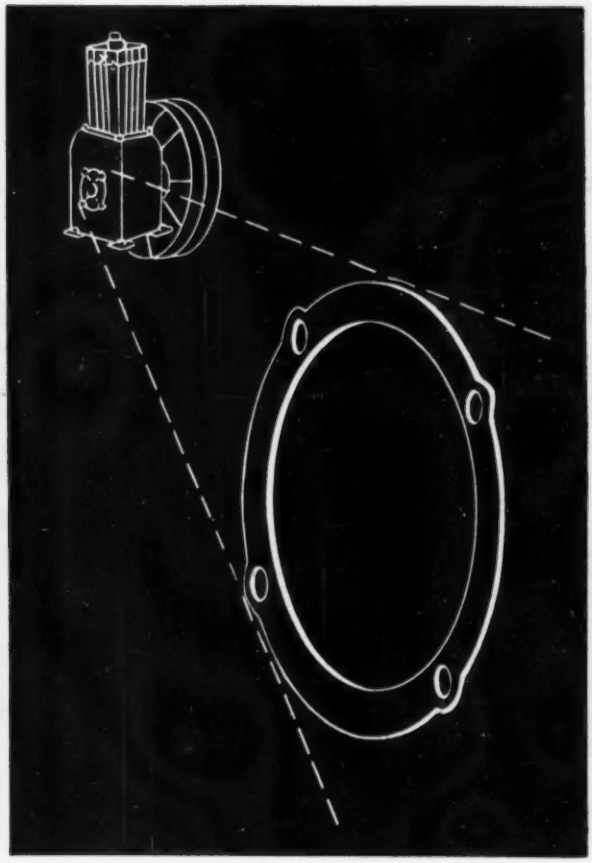
Representative explain the many features of

. . . The Vertical Chucking Grinder

The combined use of mechanical, hydraulic and electrical components provides the accuracy, flexibility, power and ease of operation so essential in precision grinding on larger sizes of work. The Bullard Vertical Chucking Grinder is available in six sizes from 30″ to 74″, made to meet every present day requirement.







No oil leakage with this new, non-shrinking fiber gasket

Leaky gaskets don't always interfere directly with an air compressor's operation, but they do bring in a lot of complaints. One compressor manufacturer had exactly this trouble with oil pan and bearing carrier gaskets made from a conventional fiber sheet. Oil and oil vapors leached out the binder, causing the gaskets to dry out, shrink, and leak.

He found an effective, economical solution by changing to an entirely new kind of fiber gasketing —Armstrong's Accopac®. Accopac is a beater-saturated material made with a non-extractable rubber latex binder. It *can't* dry out, shrink, or harden in any recommended application.

Accopac CN-705 gaskets are now specified on these compressors, improving their appearance on the job, reducing customers' cleaning and maintenance costs, and cutting down complaints greatly.

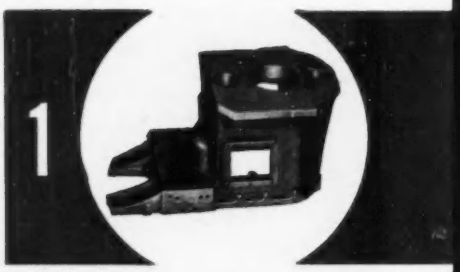
WON'T SHRINK OR DRY OUT. Accopac gives good results in this kind of service because of the way it's made. Fiber, cork, and rubber are literally locked together by a patented beater saturation method which makes each sheet uniformly strong and homogeneous. Thus, Accopac gaskets are impervious and remarkably resistant to dimensional change. Even after months of storage, they fit and seal perfectly.

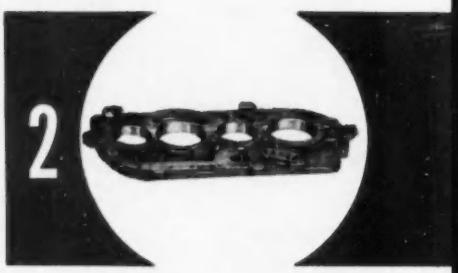
WIDE RANGE OF APPLICATIONS. Wherever dependable, low-cost sealing is required, Accopac has found ready acceptance. It's being used today in pumps, engines, aircraft and automotive equipment, household appliances, and in an ever-increasing variety of similar applications.

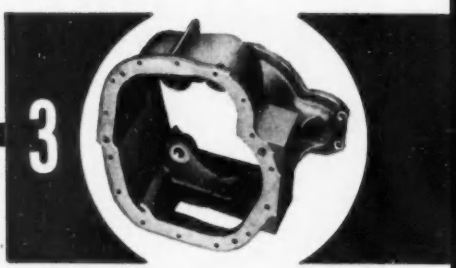
FREE 1954 GASKET MANUAL—For full information on Accopac and other versatile gasket materials, write for the 24-page manual, "Armstrong's Gasket Materials." It contains latest information on specifications, plus data on cost reduction, gasket tolerances, flange and joint design, etc. See it in Sweet's product design file, section 3h or write Armstrong Cork Co., Industrial Div., 7006 Imperial Ave., Lancaster, Pa.

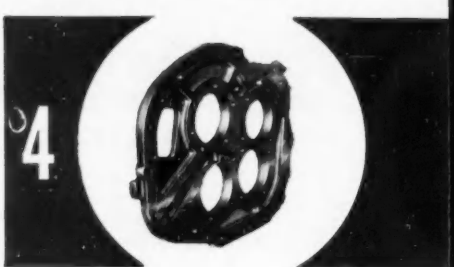
ARMSTRONG'S ACCOPAC

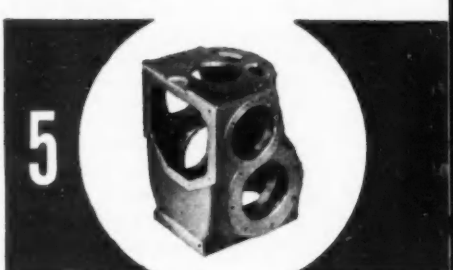
5 DIFFERENT WORKPIECES PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE











Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine . . . yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately . . . complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident . . . it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs . . . improve product quality.

ASK FOR AN ANALYSIS OF YOUR PRODUCTION METHODS

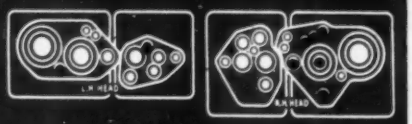
Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

W. F. & JOHN BARNES

BUILDERS OF SPECIAL MACHINES SINCE 1872

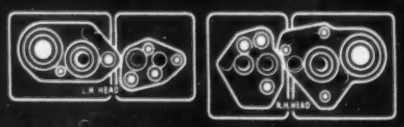
MULTIPLE SPINDLE DRILLING • BORING • TAPPING

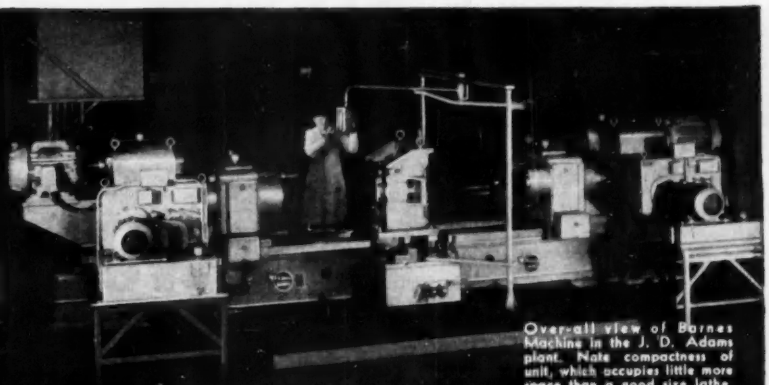
LOWER TRANSMISSION CASE



Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Final Drive Housing.

INTERMEDIATE PLATE

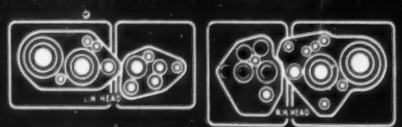




Over-all view of Barnes Machine in the J. D. Adams plant. Note compactness of unit, which occupies little more space than a good size lathe.

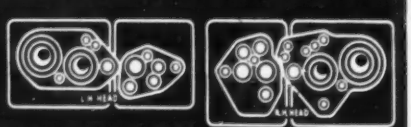
UPPER TRANSMISSION CASE

UPPER TRANSMISSION CASE COVER



Closeup of fixture used for Upper Transmission Case. Note rings for quick removal. Spindle housings are divided and gear boxes separated from housings to minimize heat rise.

FINAL DRIVE HOUSING



INVESTIGATE BARNES' 6-POINT MACHINE TOOL BUILDING SERVICE . . .

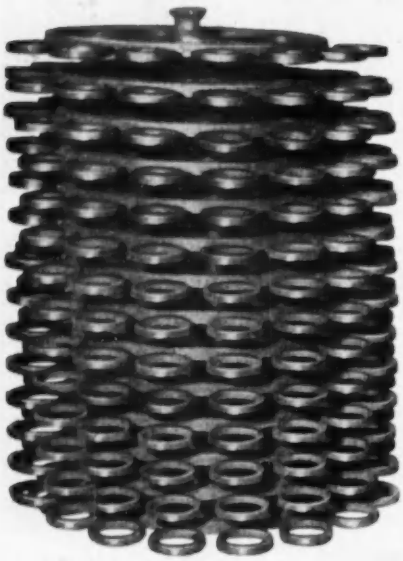
A Coordinated Creative Engineering and Manufacturing Service designed to help you solve problems quickly and efficiently. Write today for your free copy of *"Coordinated Machine Engineering"*.

W. F. & JOHN BARNES COMPANY • 819 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

Solid Eatonite Valve Seat Inserts

Heat Resistant
Corrosion Resistant
Wear Resistant



Individually Cast to Provide Dense, Non-Porous Structure.

For engines in heavy-duty service, where high operating temperatures are encountered over extended periods of time, valve seat inserts cast in solid Eatonite pay for themselves many times over. The combination of Eatonite Valve Seat Inserts and Eatonite-Faced Valves virtually eliminates valve failure caused by prolonged operation at excessive temperatures, and maintains a high level of engine output. Available for all types of engines.

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PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

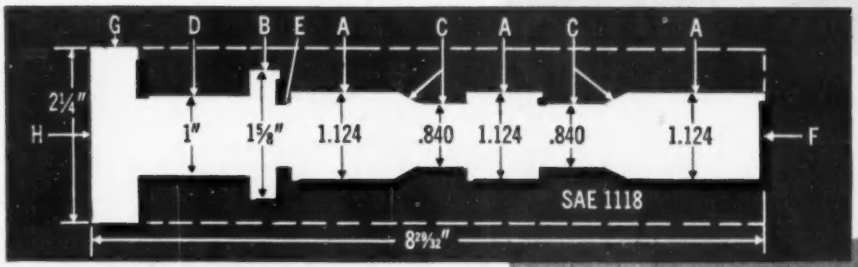
This is the difference High Velocity Turning makes

IN 1947 this job took...

11.50 min.

FLOOR TO FLOOR

A. Turn — 694 RPM — .015" Feed
B. Turn — 489 RPM — .015" Feed
C. } Form — 119 RPM — .0025" Feed
D. }
E. Face, shoulder, neck, undercut, HSS
F. Face 243 RPM — .0035" Feed
G. Knurl
H. Cut off — 243 RPM — .0035" Feed



IN 1954 this same job takes...

5.00 min.

FLOOR TO FLOOR

A. Turn — 1000 RPM — .022" Feed
B. Turn — 1000 RPM — .022" Feed
C. } Form — 340 RPM — .0035" Feed
D. }
E. Face, shoulder, neck, undercut
F. Face 489 RPM — .0055" Feed
G. Knurl
H. Cut off — 489 RPM — .0055" Feed

J & L TURRET LATHES GIVE...

MORE Ease of Operation
MORE Power Transmission
MORE Rigidity
MORE Accurate Stops
MORE Efficient Lubrication
MORE Coolant on Cutting Tools
MORE Accurate Results

Turning out a job like this in 5 min. calls for a lathe with plenty of power and the beef to back it up . . . a lathe like the Jones & Lamson #7A Universal Turret Lathe, which is specially designed to meet today's demand for more production at lower unit costs.

Only with a lathe like this can your shop take full advantage of the quality, productivity and lower costs offered by High Velocity Turning.

This job is one of the many turned at high speeds on our production line. Come to Springfield and see for yourself. At any rate, send for catalogs #101-A and #102.

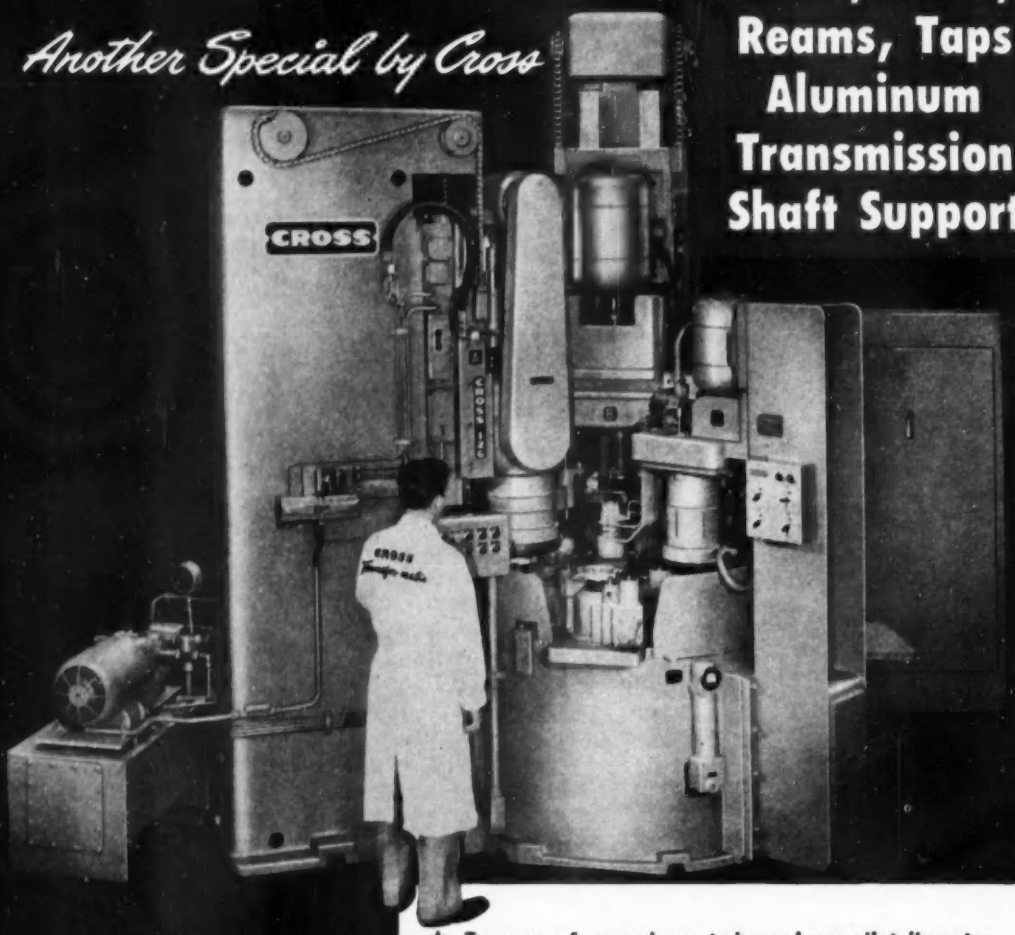
JONES & LAMSON

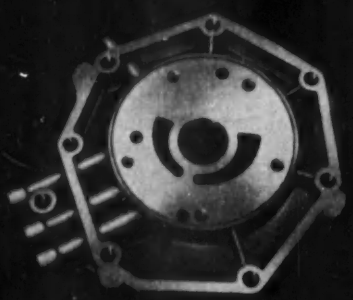
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 523 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.

Another Special by Cross

Bores, Drills, Reams, Taps Aluminum Transmission Shaft Support





- ★ Turns rear face and counterbores large pilot diameter, drills 6 holes, drills and reams 2 locating holes, chamfers and taps 5 holes.
- ★ 128 aluminum castings per hour at 100% efficiency.
- ★ 6 station fluid motor driven index table with 1 loading and 5 working stations.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Hydraulic feed and rapid traverse; hardened and ground ways; filtered coolant system; construction to J.I.C. standards; automatic work cycle.

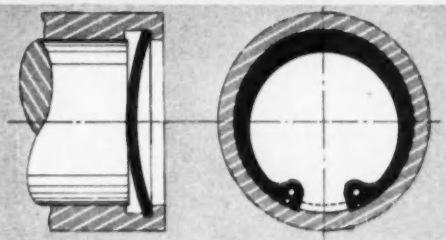
Established 1898

THE CO.

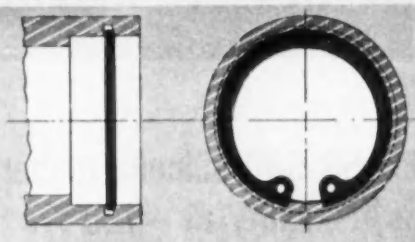
DETROIT 7, MICHIGAN

Special MACHINE TOOLS

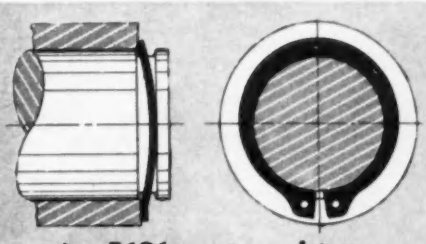
if end-play take-up is a problem
one of these special Waldes Truarc rings can solve it



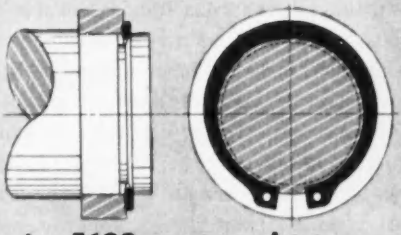
series 5001 · internal type
for bore diameters from: .250 – 1.456 in.



series 5002 · internal type
for bore diameters from: 1 – 10 in.



series 5101 · external type
for shaft diameters from: .188 – 1.438 in.



series 5102 · external type
for shaft diameters from: 1 – 10 in.

bowed WALDES TRUARC RETAINING RINGS

Take up end-play resiliently, damp vibrations and oscillations. Bent like a bow out of plane at horizontal center line. The bowed Truarc ring acts in axial direction like a floating spring without losing its tight grip against the bottom of the groove.

Maximum resilient end-play take-up: .015″ to .020″ depending on size of ring.

beveled WALDES TRUARC RETAINING RINGS

Take up end-play rigidly. When the ring is contracted (or expanded), the tapered edge acts like a wedge moving deeper into the groove and shifting in an axial direction until the ring abuts the machine part.

Maximum end-play take-up, depending on ring size: internal types, .005″ to .043″; external types, .005″ to .040″.

WALDES TRUARC is much more than a better way to hold parts together

Thousands of manufacturers have already found that Truarc Retaining Rings cut production costs and speed assembly by simplifying product design. But that's not all.

Waldes Truarc engineers have extended the use of retaining rings by developing rings that perform *additional functions* while acting as retaining shoulders. Those shown here take up end-play, compensate for wear and varying manufacturing tolerances.

No matter what your problem, there's a Waldes Truarc Ring designed specifically to solve it. Send us your drawings, your questions—Waldes Truarc engineers will work with you, at no obligation.

SEND FOR NEW CATALOG

WALDES
TRUARC
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,398,947; 2,362,946; 2,416,851; 2,420,921; 2,439,341; 2,439,705; 2,441,846; 2,455,165; 2,483,300; 2,483,393; 2,487,893; 2,487,903; 2,491,306; 2,509,081 AND OTHER PATENTS PENDING.

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

Please send me the new Waldes Truarc Retaining Ring catalog. AY 066

(Please print)

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone____ State_____

COLD 50° F LOWER THAN MT. EVEREST'S CAN'T FAZE THIS G-E SILICONE RUBBER!

G-E CLASS 500 silicone rubber retains flexibility at —120 F

Specifically designed for high-altitude and arctic aircraft applications, General Electric CLASS 500 silicone rubber compounds have become the standard in the industry. Unmatched in low-temperature serviceability by any known elastomer, including other silicone rubbers, they make ideal gaskets and seals for airframe openings, aerodynamic balance surfaces, ignition cable, external limit switch covers and other applications where low-temperature operation is vital. When you specify General Electric CLASS 500 silicone rubber, you can count on properties such as these:

- ★ **Flexibility at 120 degrees below zero F**
- ★ **Low compression set and quick recovery at sub-zero temperatures**
- ★ **Serviceability over a 600-degree range (—120 to 500 F)**
- ★ **No plasticizers to boil out at *high* temperatures**

Ask your fabricator

about G-E CLASS 500 silicone rubber for low-temperature applications! Compounds are available in a variety of hardnesses, or special compounds can be made to your exact specifications from G-E silicone gums. For the names of experienced fabricators and for complete technical data, just send the coupon!

See your "Sweet's File for Product Designers" for complete details on G-E silicones.

G-E silicones

fit in your future

GENERAL ELECTRIC

General Electric Company
Section 461-2C
Waterford, New York

Please send me product data on G-E CLASS 500 silicone rubber, including a free copy of *Imagineering with Silicone Rubber* and list of fabricators. I am chiefly interested in:

1 ( ) Molded gaskets, bushings
2 ( ) Molded boots, sleeves, bellows
4 ( ) Shock mounts
8 ( ) Sponged products
9 ( ) Extruded seals, tubing
10 ( ) Reinforced ducting, hose
11 ( ) Sheets and blankets
20 ( ) Wire and cable insulation
30 ( ) Coated tapes, cloths, sleeves

Name_____ Position_____

Firm_____

Street_____

City_____ Zone____ State_____

IN CANADA: Mail to Canadian General Electric Company, Ltd., Toronto

Some sales aids are still in crystal balls—
but—The SEATS of the Future are HERE!

MAYBE tomorrow will bring you the greatest new feature that ever sold a car. Maybe. But if you're interested in *today*—feast your eyes on this richly sculptured AIRFOAM seat.

Strictly custom? You'd think so—but seats like this are helping sell cars of *many* price ranges right NOW!

They're doing that job because people want AIRFOAM—and plenty of it—in seats and backs and armrests, front AND rear.

They're doing that job because people want the advanced styling made possible by AIRFOAM design-engineering!

And people are *getting* these things, right NOW. Are they getting them in your line, too? Goodyear, Automotive Products Dept., Akron 16, Ohio.

MORE AIRFOAM IN YOUR LINE—MEANS MORE NAMES ON THE DOTTED LINE!

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Airfoam MADE ONLY BY **GOODYEAR**

THE WORLD'S FINEST CUSHIONING

You may be throwing away your profits...

with out-of-date instruments

The tremendous progress in instrumentation that has come out of Honeywell's intensive development program has made many older instruments obsolete. Modernizing your plant instruments, to take full advantage of this progress, can bring you a number of specific benefits.

You can save labor . . . by utilizing centralized control, automatic time-cycle systems and other concepts that save steps and reduce routine man-hour expenditures. You can cut maintenance . . . by installing instrumentation that is not only easier to service, but also requires the absolute minimum of attention. You can reduce rejects . . . because modern controls can maintain the tighter processing tolerances needed for today's exacting specifications. You can improve product quality. And you can make your cost accounting more accurate than ever before.

Replacing old instruments with new can well prove one of the best ways to invest your modernization appropriation. A Honeywell application engineer will be glad to survey your present plant instrumentation. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

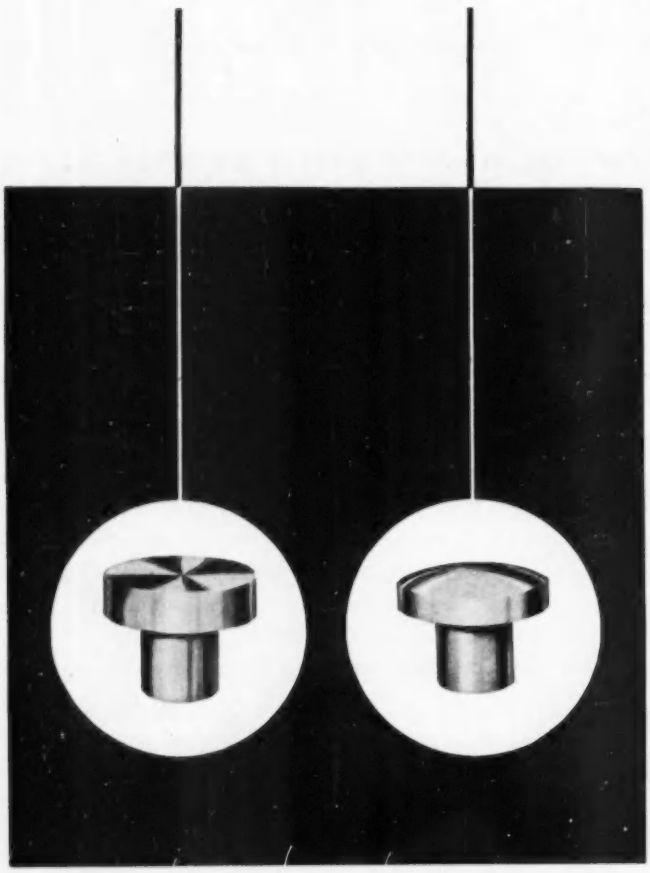
MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

Avoid delivery delays . . . save money . . . with

P.R. MALLORY & CO. Inc. MALLORY STANDARD STOCK Silver Rivet Contacts



Next time you design or order fine-silver headed rivet contacts, check through the list of standard stock Mallory types and sizes. Out of the 70 different sizes and styles of contacts that Mallory carries in stock for immediate shipment, you'll probably find one that fits your exact requirements.

By using standard stock Mallory contacts, you can save time and money in several ways:

SAVING: in time and cost of special designs and tooling

QUICK SHIPMENT: orders from stock are usually shipped within 24 hours.

SAMPLES: immediately available, where necessary.

SMALL QUANTITIES for pilot runs and job orders are delivered promptly.

Mallory's contact standardization program was the result of an intensive survey of thousands of customer prints and usage records. From an analysis of these, 70 sizes were selected which match the great majority of applications for fine-silver headed rivet contacts, in both flat and radius-faced designs.

Dimensions, part numbers and prices of Mallory stock contacts are listed in a new folder. Write for your copy today . . . and use it as a "preferred list" for present and future specifications.

Special Contacts

If unusual requirements call for a contact outside of the standard list, Mallory engineers are well qualified to recommend a specialized contact design. At your service are Mallory's wide range of contact materials, and efficient facilities for manufacturing contacts and complete contact assemblies.

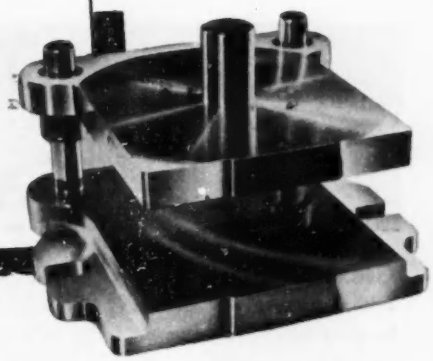
Expect more . . . Get more from MALLORY

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

World's fastest die set service in action



Now—Danly unites mass production techniques with the precision touch of craftsmanship to bring you the fastest die set service . . . ever.

Never before has there been a die set service as fast as the one that Danly now offers to you. Unique in concept, the system had its beginning some years ago when Danly originated its network of nationwide Danly Branches. Under such a system the main Danly Plant in Chicago provided thousands of *interchangeable* die set parts to Danly Branch Plants. It meant that such parts were easily assembled into standard die sets and then quickly delivered to meet the requirements of any tooling program.

But, as buyers recognized the convenience of Danly service, demands on the Chicago Plant grew to exceed capacity. The solution? . . . an unprecedented move in the die set field. Danly put die set manufacture on a mass production basis with no sacrifice of famous Danly precision. It was accomplished with amazing new facilities in the form of two complete production lines devoted exclusively to high speed, precision die set production. The next time you put one or a dozen Danly Die Sets on order, expect to get fast delivery from any Danly Branch, expect to get die sets unequaled in precision. You can expect it and you'll get it . . . when it's Danly.

Here's where faster die set service begins, on Danly's high speed precision production lines . . . the finest mass production facilities in the die set field.

Here's where your order is received . . . in one of Danly's Branch Plants. Because all die components are close at hand, your order is filled immediately.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

Fast, nationwide delivery from these plants

***CHICAGO** 50	2100 S. Laramie Avenue
***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
***PHILADELPHIA** 40	511 W. Courtland Street
***ROCHESTER** 6	33 Rutter Street

**Indicates complete stock.*

Twice Thirty-Five Years of Reliability

Gust and Carl Theden, father and son, both have worked at MECHANICS for over thirty-five years.

They are typical of the father-and-son or brother-and-brother combinations at MECHANICS.

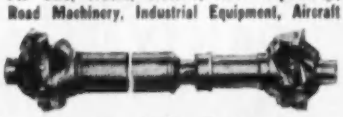
When the MECHANICS 25 year Club was organized in 1945, 3 percent of the employees were made members. By 1949 this figure had risen to 6 percent. Now, seventeen percent (one of every six) MECHANICS workers have been making universal joints the best they know how for 25 years or more.

It takes considerable Pride of Accomplishment to keep a man working at the same task for over a quarter of a century.

This devotion to an ideal is reflected in the reliable service that always has characterized MECHANICS Universal Joints.

MECHANICS
Roller Bearing
UNIVERSAL JOINTS

For Cars, Trucks, Tractors, Farm Implements, Road Machinery, Industrial Equipment, Aircraft

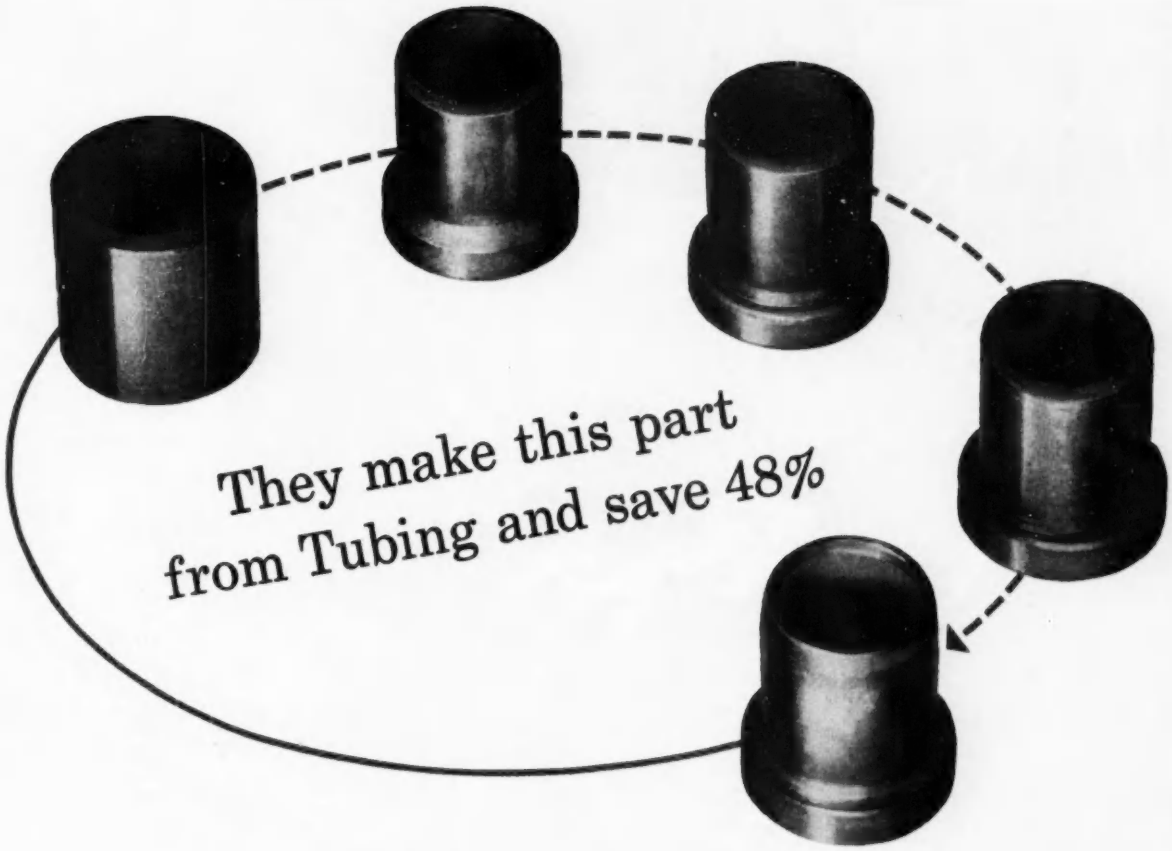


Our engineers will be glad to show you how MECHANICS Roller Bearing UNIVERSAL JOINTS will help insure the reliable operation of your product.

MECHANICS UNIVERSAL JOINT DIVISION

Borg-Warner

2024 Harrison Ave., Rockford, Ill.



This part used to be made out of solid bar stock on a screw machine. Costly? You bet. 12½ cents each. Lots of expensive machining. Lots of metal wasted to make a hole.

Now, Northwestern Corporation, Morris, Ill., makes it out of tubing. ELECTRUNITE Mechanical Tubing, 1½ O.D. x 11 gage. The customer gets it in 14-foot lengths, cuts it off into 2″ lengths.

Next, the tubes are formed in a series of dies. Pretty drastic reductions, but the ELECTRUNITE Tubing can take it. Then they're machine finished in one operation.

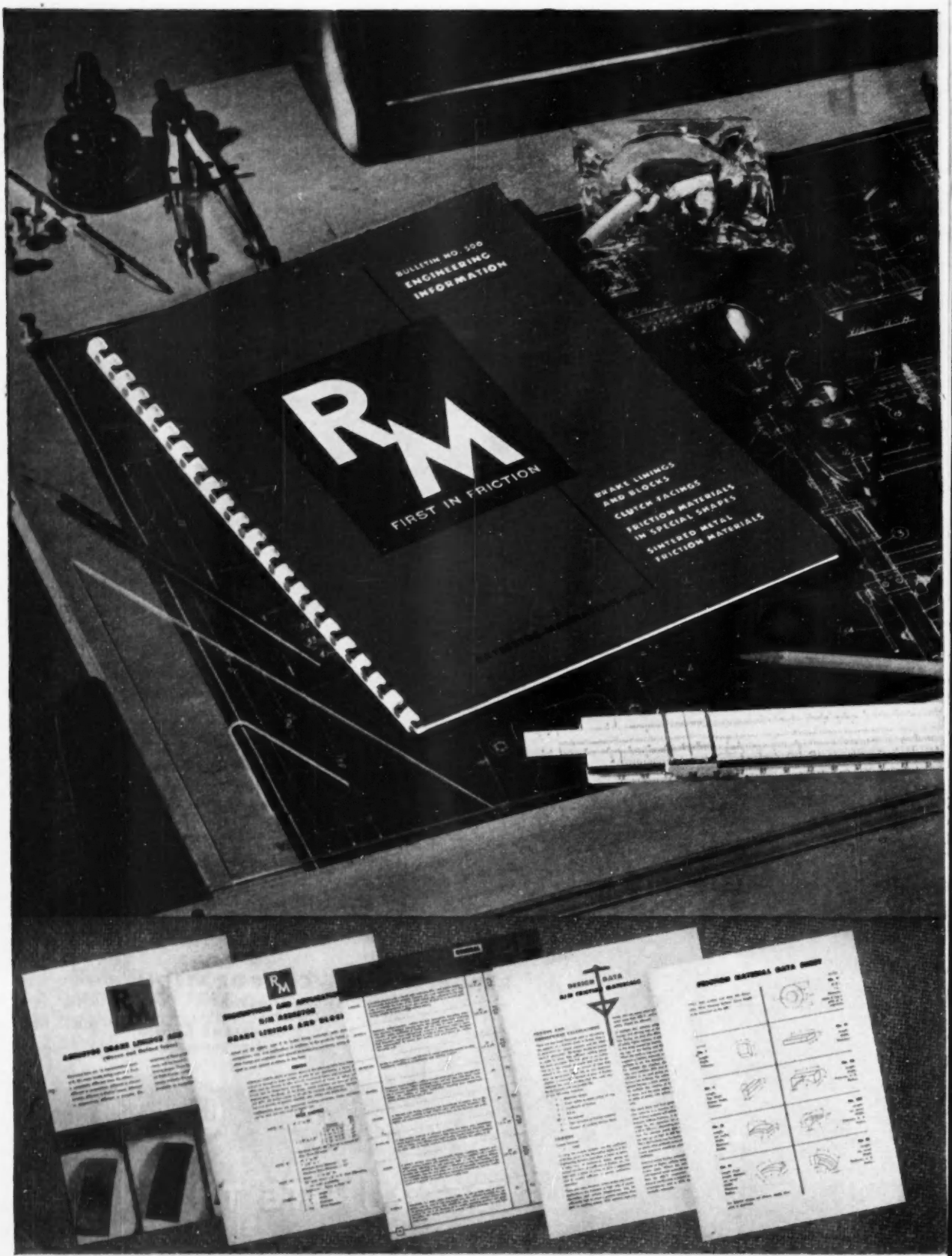
The result: Each part now costs only 6½ cents. Multiply that by several million parts a year the manufacturer produces and you come up with a sizable saving.

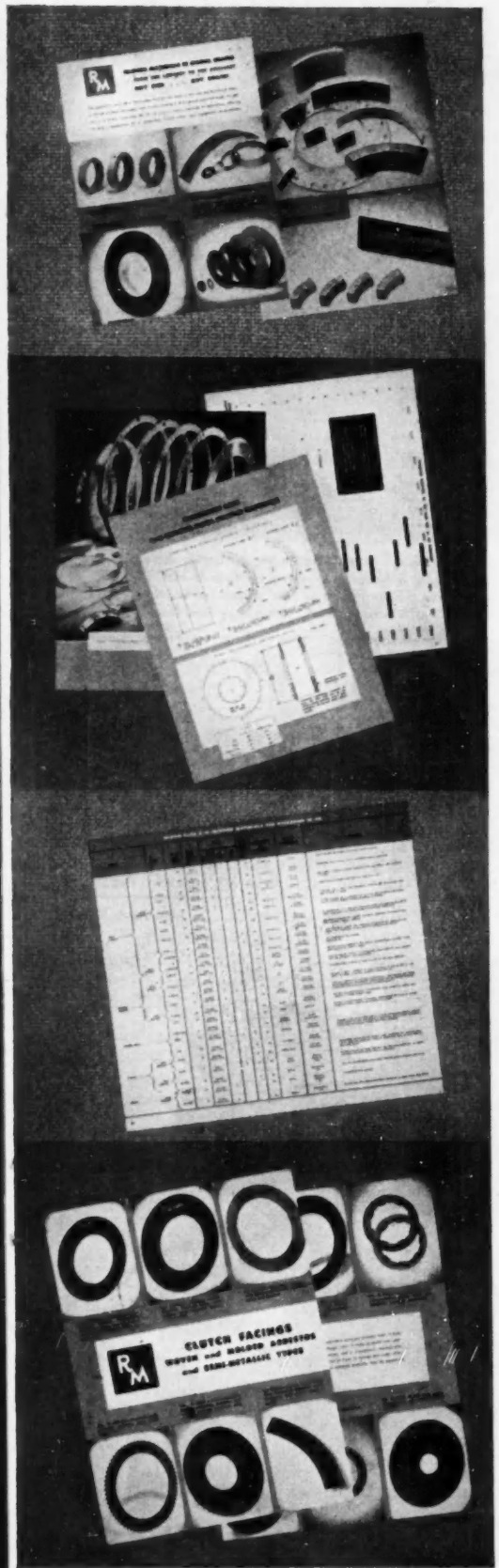
Unusual, you say? Not at all. Republic has helped a lot of manufacturers cut costs drastically by helping them design with Republic ELECTRUNITE Tubing. A call to your nearest Republic Sales office will bring you all the facts.

REPUBLIC STEEL CORPORATION
Steel and Tubes Division
252 E. 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

REPUBLIC STEEL

Republic
ELECTRUNITE TUBING


BULLETIN NO. 500
ENGINEERING
INFORMATION
RM
FIRST IN FRICTION
BRAKE LININGS
AND BLOCKS
CLUTCH FACINGS
FRICTION MATERIALS
IN SPECIAL SHAPES
SINTERED METAL
FRICTION MATERIALS



Just off the press!

R/M BULLETIN No. 500

44 pages of engineering data on the use of R/M friction materials

Pictured at the left are a few of the many charts, diagrams, photographs, and pages of engineering information included in R/M Bulletin No. 500. Engineers looking for practical design and engineering data on friction materials will find their answers in the 44 pages of this new and comprehensive Raybestos-Manhattan bulletin. Its contents are intended as a guide in the choice of the friction material and as an aid in the design of the friction device. An outstanding feature, to pick just one, is the selection chart (3rd photo from top), which gives complete design data for R/M friction materials operating in oil.

R/M Bulletin No. 500, plus consultation with an R/M representative, should enable you to reduce most of your friction material problems to a minimum. R/M, remember, is the world's largest maker of friction materials. It is constantly experimenting with countless combinations of woven and molded asbestos, semi-metallic materials, and sintered metal. And because it works in both the asbestos and the metal fields, its advice is always impartial.

Write for your free copy of R/M Bulletin No. 500

R/M
FIRST IN FRICTION

The trade-mark that spells progress in friction material development

RAYBESTOS-MANHATTAN, INC.

EQUIPMENT SALES DIVISION: 6010 Northwest Highway, Chicago 31, Ill.

Detroit 2 Cleveland 14 Los Angeles 58

Factories: **Bridgeport, Conn. Manheim, Pa. Passaic, N.J. No. Charleston, S.C. Crawfordsville, Ind. Neenah, Wis. Canadian Raybestos Co. Ltd., Peterborough, Ont.**

RAYBESTOS-MANHATTAN, INC., Brake Linings • Brake Blocks • Clutch Facings • Fan Belts Radiator Hose • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Rubber Covered Equipment • Asbestos Textiles • Packings • Abrasive and Diamond Wheels • Bowling Balls

YOU'RE *RIGHT* in the driver's seat

WITH

POTTER & JOHNSTON

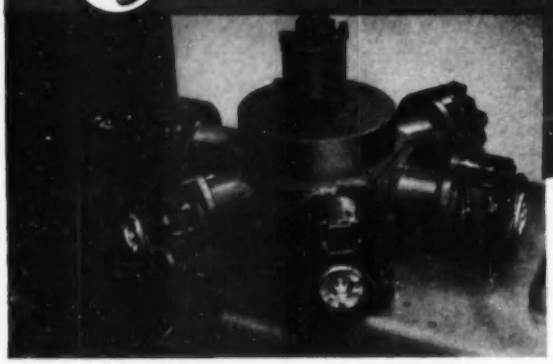
3-U *SPEED-FLEX*

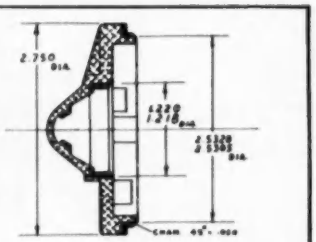
Automatic Turret Lathes

AND

TOOLING

American Bosch manufactures small electric motors used in seat adjuster mechanism for Lincoln-Mercury and other passenger cars. The aluminum housings required are machined at 170 pieces per hour.



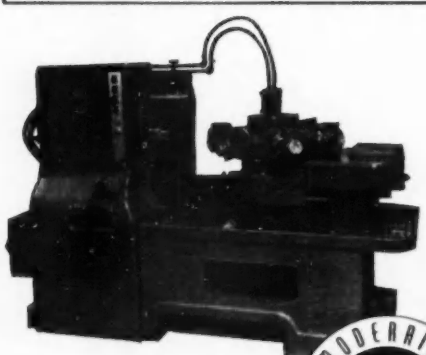


MACHINED SURFACES ARE INDICATED BY HEAVY LINES

Here is an outstanding example of how Potter & Johnston Automatic Turret Lathes, plus P&J Tooling, puts you in the driver's seat—right out in front of competition. The versatility of the 3-U Speed-Flex permitted *mounting the cutting tools in the revolving spindle and chucking the work pieces in the Turret* during machining time.

Machine loading time was eliminated, costs lowered, and production greatly increased by the use of air operated chucks on each of the six turret faces. The operator simply inserts the work piece in the open jaws, a stationary air-cylinder (operated by the dog-drum) automatically controlling chuck opening and ejection, and chuck closing. Turret indexing is automatic, rapid and accurate. Idle cutting time is reduced to a minimum . . . the fast, rapid-traverse mechanism moving the turret slide quickly to within 1/64" of feeding position.

You too can benefit from this combination. At no obligation, send today for your copy of the 3-U Bulletin No. 145 . . . or ask our Tool Engineers to submit recommendations based on your own prints or sample parts.



MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

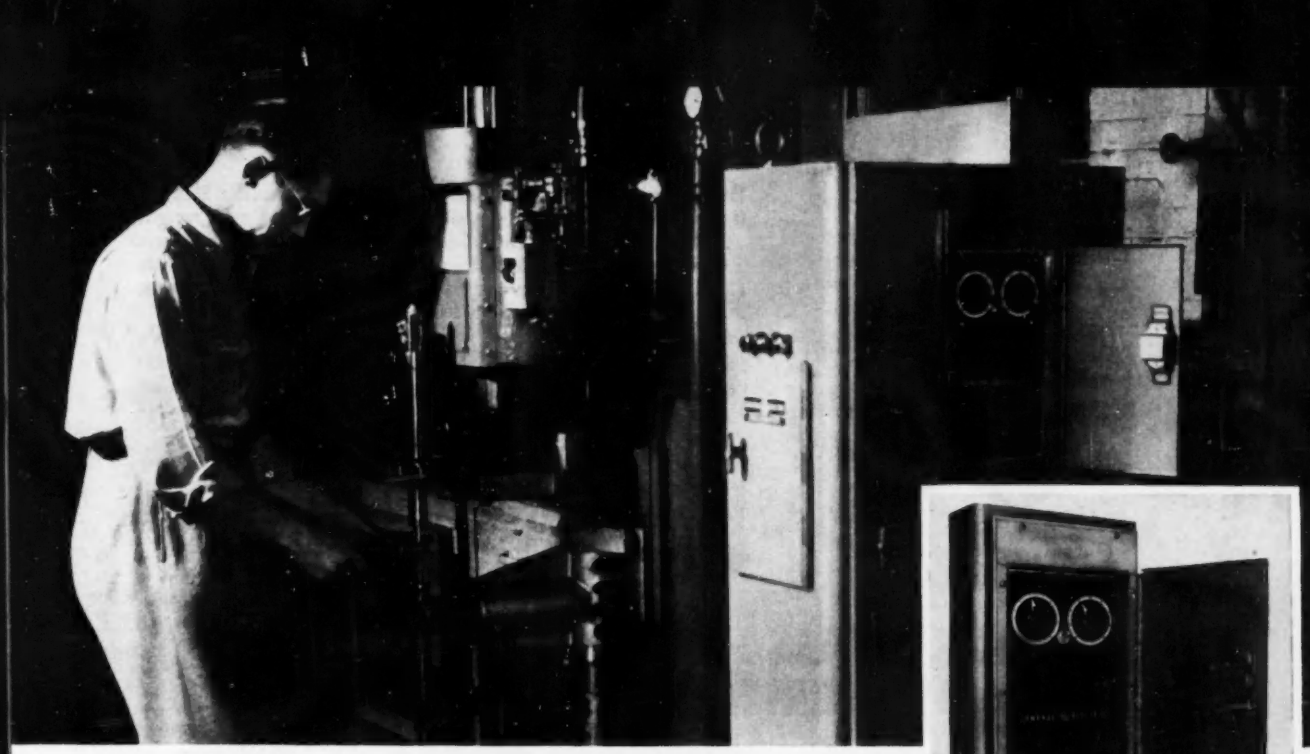
POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

PRATT & WHITNEY

DIVISION NILES - BEMENT - POND COMPANY



NO DETRIMENTAL FLASH, SPATTER, OR EXPULSION in welding aluminum or stainless steel assemblies when you use G-E Slope Control. Shown here applied to a G-E synchronous precision resistance welding control, this accessory overcomes the disadvantages of suddenly applied welding currents . . . gives longer electrode life and reduces tip pickup. Slope time dial is at left, heat control setting at right.

Now, Standard Welding Machines Meet Special Production Requirements

with G-E Accessories for Resistance Welding Controls

Easily added to present equipment or included in your new G-E resistance welding control, these special-purpose G-E accessories now make possible special production performance with standard machines. They can be applied to synchronous or nonsynchronous controls.

Practically any application requirement can be met with G-E controls . . . correcting for current voltage variations, controlling rate at which current rises to welding value, tempering or forging, etc.

For complete information on G-E control and control accessories for resistance welding contact your nearest G-E Apparatus Sales Office or your welding machine manufacturer, or send in coupon at right.

General Electric Company, Section E790-2
Schenectady 5, New York

- ☐ GEA 6075, Accessories for Resistance Welding Controls
- ☐ GEA 5945, Synchronous-precision Control
- ☐ GEA 5816, The Story of Resistance Welding—theory behind the process and complete description of all G-E controls

Name .....

Company .....

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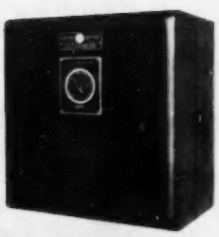
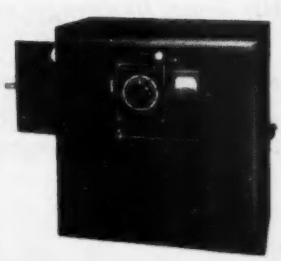
GENERAL ELECTRIC

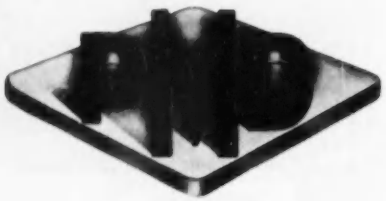
IMPROVE WELD QUALITY—correct incoming voltage variations with G-E Voltage-compensating Regulator . . . maintains rms weld current within ±2%.

REDUCE REJECTS—for better, more consistent welds this self-enclosed and completely automatic G-E Current Regulator maintains constant welding current within ±2% of preset value.

REDUCE WELD CRACKING and porosity, eliminate excessive indentation. G-E Up-down Slope Control provides gradual current increase and decrease.







Have you considered the advantages of light alloy fabrication – to widen design potential . . . conserve space, save weight . . . reduce fabrication and assembly costs? Many manufacturers are working actively along these lines, and PMD is frequently called upon to assist in the development of light metal parts, and the attendant production tooling.

One of America's largest independent producers of dies, molds, special machines and devices for non-ferrous metals, PMD offers facilities that are complete! Design and engineering service – skilled, experienced personnel – and the right equipment to do the job!

For top production results, with a minimum of tooling expense, call in a PMD specialist. Investigate the many ways that PMD can help you with light alloy fabrication problems. Write or phone today.

PERMANENT MOLD DIE COMPANY, INC.
2271 East Nine Mile Rd., Hazel Park, Mich., Slocum 7-8100

SPECIALISTS IN PRODUCTION TOOLING FOR LIGHT ALLOY FABRICATION!

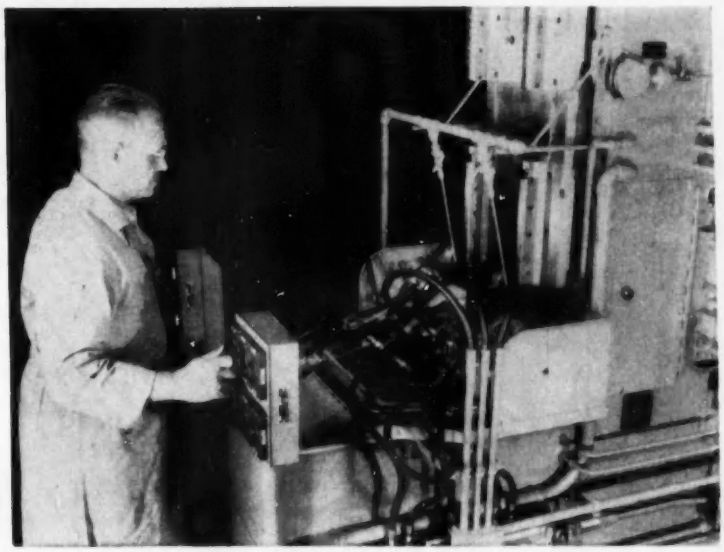
Make PMD Your Headquarters For

NON-FERROUS

EXTRUSION DIES • DIE CASTING DIES • PERMANENT MOLDS & PISTON CORES • SHELL MOLDING PATTERNS

Special Machines: Coilers for Tubing • Molding Devices (permanent mold)
Trim Dies • D. C. Casting Units • Billet Molds

ANOTHER *American* FIRST



FIXTURE TILTS AUTOMATICALLY TO BROACH TWO PADS 70° APART IN ONE PASS

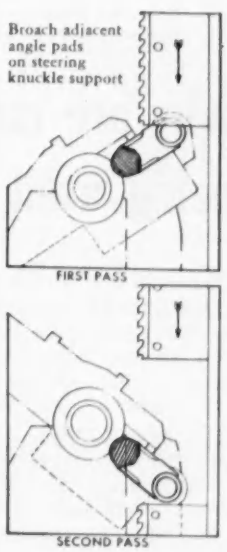
standard American machine and broaches, special American fixture solve problem

Two angle pads located 70° apart on a steel steering knuckle support are broached in one pass on a standard American vertical single ram surface broaching machine. A two station fixture on a receding work table is provided to allow for automatic tilting. Two broaches are mounted in vertical line for each station with a gap of about 12″ between them. This gap allows clearance for the part to be tilted into position for broaching the second pad.

The operator loads two parts. The parts are then automatically clamped and the receding table moves into broaching position. The first pad is broached — then between the gap, the fixture automatically indexes tilting the part so that the second pad can be broached. The table automatically moves back, parts tilt up and automatically unclamp, and the operator is ready to begin the cycle again.

American engineers are equally adept at designing machines, broaches and fixtures to solve your metal removal problems. Send a part print or a sample with your hourly requirements for a suggested solution. There is no obligation on your part.

American Circular 300 which lists all the standard American Vertical Hydraulic Surface Broaching Machines is yours for the asking. Write for it today.



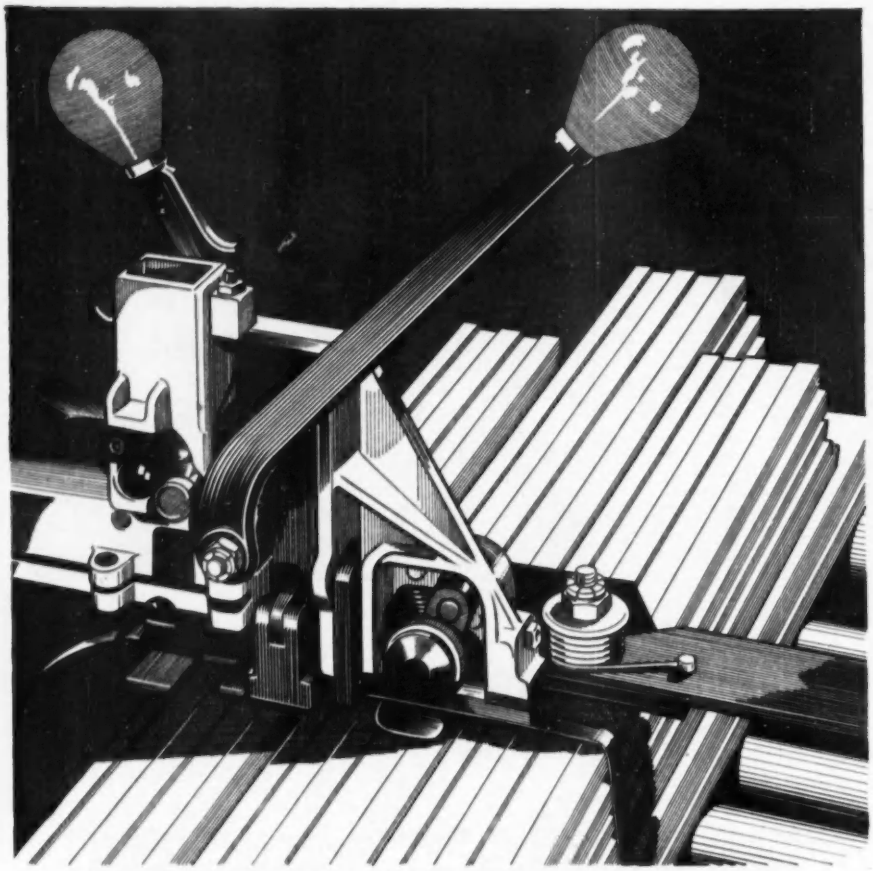
AMERICAN **American** BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



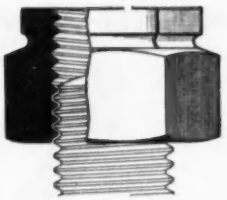
Wherever assemblies must be held together—on metal strappers or dishwashers—more and more original equipment manufacturers and maintenance men are relying on FLEXLOC locknuts for safe, dependable locking.

Why are more and more FLEXLOC locknuts being used to hold assemblies together?

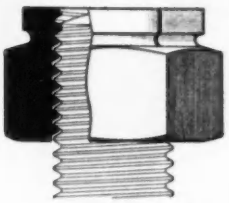
There are a number of reasons. FLEXLOCS are one piece, all metal—no lockwashers to break, no cotter pins to shear, no auxiliary locking devices to deteriorate. FLEXLOCS stay put wherever you place them—as stop nuts or seated nuts—once their locking threads are fully engaged. Because they won't work loose, they reduce costly service calls. FLEXLOCS have higher tensile, are stronger than most other locknuts. And they withstand temperatures as high as 550°F.

FLEXLOCS have the additional advantage of reusability. They can be applied again and again without loss of efficiency. Because they are safe and dependable, you'll find more and more FLEXLOCS being used where vibration is severe—on automotive equipment, compressors, machine tools, household appliances, high-speed looms, aircraft.

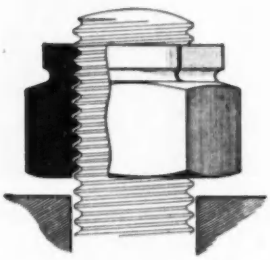
FLEXLOCS are available in a wide range of sizes in any quantity. Stocks are carried by leading industrial distributors everywhere. Write for literature and samples for test purposes. STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.



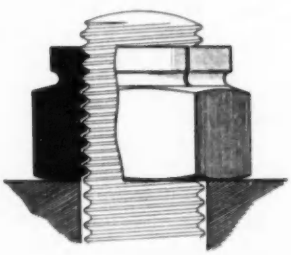
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



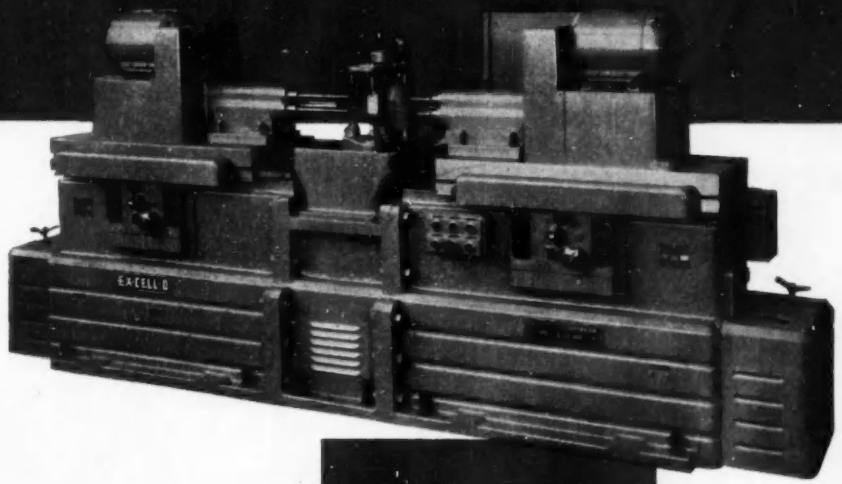
Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not loosen a FLEXLOC, yet there is no galling of threads.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

Modernize Today for Profits Tomorrow

WITH FAST, VERSATILE PRECISION WAY MACHINES



STYLE 58 TWO-WAY: Operates from a single push-button station. Handles large, heavy work. Fixture section can be designed to accommodate the way units from any angle.

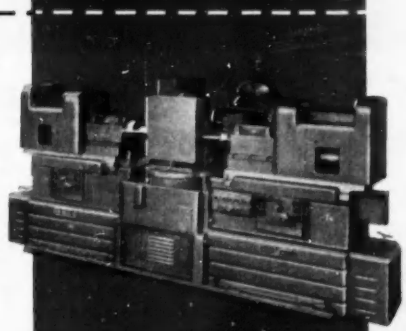
Units may be re-arranged around fixture or new fixture sections designed for different operations.

STYLE 54 ONE-WAY: A standard way unit combined with a fixture unit to suit the work. Large, heavy, and awkward parts, loaded in the fixture, remain stationary; the spindles advance to the work.

EX-CELL-O

WAY TYPE PRECISION BORING MACHINES ARE PROFIT INSURANCE

Way Machines perform such operations as precision boring, turning and facing. They consist of one or more standard way units combined with a fixture section. Each way unit has its own hydraulic system and controls to operate the spindle slide. Tooling and fixture are added to suit the individual operation. Get details from your Ex-Cell-O representative or write for Way Machine Catalog.



STYLE 54 THREE-WAY: Standard way units are electrically interlocked to operate simultaneously, or in any sequence. Fast and efficient for machining parts from three directions and holding accurate locations.

STYLE 58 FOUR-WAY: Controlled from a central push-button station. Particularly suitable for machining parts from four directions simultaneously, and performing progressive operations.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO
EX-CELL-O for PRECISION

54-3

Bendix power

STEERING AND BRAKING

sells more cars

satisfies more customers

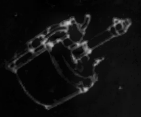
Today's most wanted power features for cars and trucks

Bendix * low pedal POWER brake

Specified by more car manufacturers than any other make, Bendix Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from stop-and-go controls. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!

Bendix * POWER steering

Because Bendix Power Steering is of the linkage type, it may be adapted to any manufacturer's model without extensive engineering changes in present steering designs. Meet the increasing demand for power steering more efficiently and more economically with Bendix Power Steering.



Bendix HYDROVAC* POWER brake

With over four million in use, the Bendix Hydrovac is by all odds the world's most widely used power brake for commercial vehicles. This overwhelming preference for Hydrovac is a result of sound engineering design, exceptional performance, low original cost and minimum service upkeep.

Bendix AIR-PAK* POWER brake

With one simple compact unit, Bendix Air-Pak combines all of the well-proven advantages of hydraulic brake actuation with an air brake system. An important advantage of Air-Pak is that brakes can be applied by foot power alone when braking is required before air pressure builds up or if it should fail for any reason.

*REG. U.S. PAT. OFF.

The term "Bendix Power" not only identifies the industry's outstanding power braking and power steering equipment, but describes the unmatched engineering and manufacturing resources behind these products.

It is well that Bendix Products Division be thought of in this dual capacity, for the outstanding acceptance of Bendix power units stems largely from the fact that industry has learned over the years to look to Bendix for the latest and best in power equipment for cars, trucks and buses.

Bendix Products Division

BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA

Bendix AVIATION CORPORATION

Export Sales: Bendix International Div. 205 E. 42nd Street, New York 17, N. Y.

AUTOMOTIVE INDUSTRIES

BUSINESS DEPARTMENT

G. C. Buzby, President and Manager
Automotive Division
E. H. Miller, Advertising Mgr.
E. W. Hevner, Circulation Mgr.
John Pfeffer, Promotion Mgr.
Charles W. Hevner, Research Mgr.
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone GRanite 4-5600

REGIONAL MANAGERS

CHICAGO—John T. Hoole
916 London Guarantee
and Accident Building
Chicago 1, Ill.
Phone FRanklin 2-4243

DETROIT—E. E. Elder
1015 Stephenson Bldg.
Detroit 2, Mich.
Phone TRinity 5-2090

PHILADELPHIA and NEW YORK
Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone GRanite 4-5600
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

CLEVELAND—Jack C. Hildreth
1030 National City Bank Bldg.
Cleveland 14, Ohio
Phone CHerry 1-4188

SAN FRANCISCO—
R. J. Birch and Frank W. McKenzie
300 Montgomery St.
San Francisco 4, Calif.
Phone DOuglas 2-4393

LOS ANGELES—L. H. Jackson
3156 Wilshire Blvd.
Los Angeles 5, Calif.
Phone DUnkirk 7-2119

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High Spots of This Issue

★ Full Automation for Piston Pins

Even such small parts as piston pins have been adapted to automated production lines at the Ford Dearborn engine plant. The author also explains in this third article of a series how manifolds are machined automatically. See Page 48.

★ Automatic Inspection of Cylinder Blocks

Operations involved in the manufacture of the cylinder block form the subject of this study of Mercury powerplant production at the Ford Cleveland engine plant. Readers will recall a previous story on cylinder head machining. Page 52.

★ Suppliers Are Important to the Truck-Trailer Industry

Any type of business, large or small, which does little actual manufacturing of its own is highly dependent upon outside sources of supply. Such is the case with the truck-trailer industry, whose requirements are enormous. Page 56.

★ Plastic Bodies and Gas Turbine Car at Turin Show

Despite the onerous quota restrictions, Italy's recent automobile show brought out 450 exhibitors from 11 nations, and 66 makes of cars were represented. This on-the-spot report covers significant highlights of the exposition. Page 62.

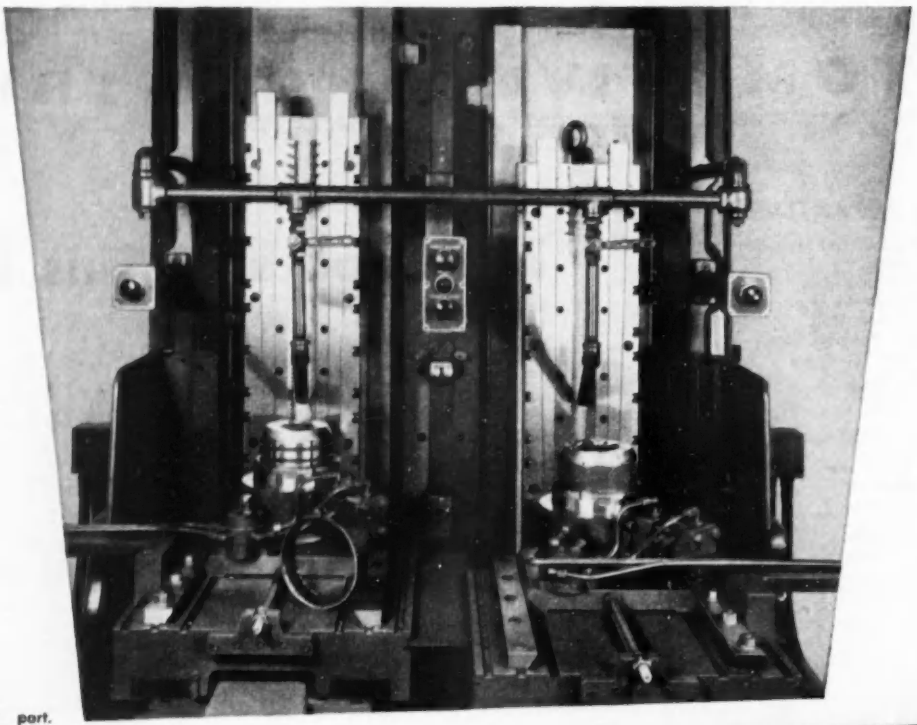
★ Basic Production Methods for Aluminum Pistons

Focal point of this article is found in a discussion of the permanent mold casting method for aluminum pistons. The study is the second of three based on data presented at the Alcoa Piston Symposium. The third will appear soon. Page 68.

★ 33 New Product Items And Other High Spots, Such As:

World's largest extrusion press; latest in jet test cells; Studebaker Champion automatic transmission; new aids for inspection; British race engine; more cores per man-hour with automatic machines; and mold with integral oven for plastic target.

Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3



Drawing of part. Solid area indicates material removed.

CINCINNATI Duplex Hydro-Broach tooled up to broach transmission band assembly

Material	Steel
Operation	Broach 41° angular grooves
Stock removal	From solid
Production	283 per hour
Equipment	CINCINNATI Duplex Vertical Hydro-Broach Machine

THIN RINGS BROACHED WITH NO DISTORTION

You probably have been stymied more than once by machining operations on thin fragile parts. How one part of this type was taken out of the headache class and set up in a smooth, low-cost production schedule is illustrated here. It shows a CINCINNATI Duplex Vertical Hydro-Broach Machine, tooled up to broach the ears on transmission band assemblies. ¶ There are two hydraulically operated, manually controlled fixtures, one for each ram. While the part in one station is being broached, the operator reloads the other fixture. He can take as much time as necessary because the rams do not go through their cycle until the pre-set cycle buttons are pressed (a CINCINNATI safety feature). Other CINCINNATI advantages for low-cost broaching operations include hardened and ground ways... automatic way lubrication, with manual flushing lever... dove-tail clamp arrangement for interchangeability of broach holders and cutting tools as a unit. Principal features and specifications are outlined in Sweet's Machine Tool Catalog. If you would like to have complete data, write for publication No. M-1709-1.

CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Catalog No. M-1709-1 contains complete specifications. Write for a copy.

THE CINCINNATI MILLING MACHINE CO.
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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 110, No. 11 June 1, 1954

General Motors Segregates Its Transmission Output

As a result of its disastrous Hydra-Matic plant fire last year, General Motors has revised its production setup at its Saginaw Steering Gear Div. It now has its facilities arranged so that a similar fire in any one of its plants would not close down any of its car making divisions.

Its production is integrated so that Chevrolet and Pontiac gears are produced in its newest plant east of Saginaw, and Cadillac, Oldsmobile, and Buick units in other plants. In case of a serious fire or other disaster, Chevrolet and Pontiac gears could be used in Cadillac, Olds, and Buick or vice versa. While not specifically designed for use in other cars, the units would be adequate to meet emergency needs.

NEW MACK TRACTOR QUARTET MEMBER

Four new tractors of high power-to-weight ratio have been announced by Mack Trucks, Inc., to round out its "B" Model line. Designated as Models B-70T, B-70ST, B-71T, and B-71ST, the tractors are four- and six-wheelers, gasoline and Diesel-powered. Four-wheel models are rated from 50,000 GCW to 63,000 GCW, depending upon trailer axle combinations, while the six-wheel versions carry a 76,800-GCW rating. Model B-70ST (shown here) is powered by a 707 cu in., 206-hp Thermodyne engine.

Ford Sells Hydro-Electric Plant to Michigan Company

Wolverine Fabricating & Mfg. Co., Inkster, Mich., maker of non-metallic gaskets, has purchased Ford Motor Co.'s hydro-electric plant in Dundee, Mich. The former, which employs 100 persons, did not reveal what it plans to do with the new plant.

Chrysler Consolidating West Coast Operations

In an effort to increase its operating efficiency, Chrysler Corp. will move production of Dodge and Plymouth cars from San Leandro, Calif., to Los Angeles, where it has been producing DeSoto and Chrysler cars. At the same time, the Dodge truck plant, which opened in San Leandro in 1948, will be shut. All operations will be moved to the main truck plant near Detroit.

Extensive installation of new facilities has been under way at the Los Angeles plant. Two new assembly lines are being completed there to replace the single line which formerly produced the entire Chrysler line of cars.

In addition, a new body finishing operation was completed recently at the Los Angeles plant, and Chrysler plans to install facilities for assembly of bodies from stampings shipped from Detroit. The company said that defense work at the San Leandro plant and operation of the parts plant will not be affected by the change.

New Quarters of NADA Rising In Washington

The National Automobile Dealers Assn. is constructing a modern eight-story building at the corner of K and 20th Sts., N.W., in Washington, D. C. To be known as the Automotive Building, it will serve as the national headquarters of NADA.

No Future Price Cuts Planned by Packard

Packard Motor Car Co., which recently cut prices on its luxury models in what it called a "realignment program," plans no further price reductions, according to Clare E. Briggs, company vice-president. The company, in the midst of its biggest modernization program, reported that its program to transfer production of engines, automatic transmissions, and axles to its new plant near Detroit is half completed.

The move is part of Packard's attempt to strengthen its competitive position in the industry and cut costs. When operations get underway on 1955 model production at the new plant, Packard expects to have about 1000 automatic machines in use. The company has already completed a styling and design section in its $2 million research laboratory, which is also working on plastic dies.

News of the AUTOMOTIVE

LAND BATTLESHIP WITH BIG FIREPOWER

Shown publicly for the first time recently at the Chrysler Delaware Tank Plant, the T-43 heavy tank weighs in the neighborhood of 60 tons. It mounts a long-barrel 120 mm gun as well as 30 and .50 caliber machine guns. Powered by a 810-hp, 12-cyl, air-cooled engine, the tank has a hull and turret each cast from a single piece.

Automobile Makers Point Up Popularity of Tinted Glass

The popularity of tinted glass on automobiles has grown rapidly since the first such glass was introduced by car makers about three years ago. General Motors is currently installing tinted glass in approximately 40 per cent of its cars.

Chrysler, which equipped about half of its line of cars with tinted glass in 1953, predicts that 62 per cent of its cars will have the glass by the end of this year. Nash is currently installing non-glare glass on more than 65 per cent of its total output; Packard, 46 per cent; Ford, 30 per cent; and Hudson 21 per cent.

Horsepower Boosted On GM 6-110 Diesel

Freer "breathing" and higher engine speeds have enabled Detroit Diesel Engine Div. of General Motors Corp. to increase the horsepower of the single 6-110 Diesel from 275 to 300 hp maximum and from 214 to 230 hp continuous.

The freer breathing was made possible by increasing the number of cylinder liner ports and grouping them together in partially overlapping pairs to form larger, figure "8" shaped openings. Maximum engine speed has been increased from 1800 to 2000 rpm and continuous operating speed from 1600 to 1800 rpm.

Other changes in the 6-110 Diesel include a new "high valve" injector similar to that on the Series 71 models, roller bearing idler gear mountings, and larger piston struts.

Packard Reports a Loss Of $380,000 In Quarter

Packard Motor Car Co. suffered a net loss of $380,000 and a heavy drop in sales during the first quarter of this year. The loss compares with a $3.5 million profit in the first three months of 1953. Total sales for the quarter slumped to $57.8 million from $123.7 million last year.

Packard attributed part of its loss to heavy expenditures for modernization and moving some operations to its new plant at Utica. Cost of these operations was met from current income.

The company reported that its financial position, however, continued strong. Working capital was said to be up slightly to $41.9 million from $41.2 million at the end of the comparable period last year.

Car Dealers' Earnings Declined During 1953

Profits of new car dealers before taxes fell to 0.8 per cent of sales in 1953 from 4.3 per cent in the prior year, according to the National Automobile Dealers Association. Manufacturers, NADA said, made out much better, pointing out that one car maker last year had a profit before taxes of 16.46 per cent of sales, another had 6.51 per cent, and still another, 5.97 per cent. No specific names were mentioned.

METAL MAGIC

Excess metal is now being removed from aircraft parts through a chemical process developed by North American Aviation. License to use the process may be obtained from Turco Products, Inc. An engineer is shown putting a micrometer on a section of a curved skin from which superfluous metal has been removed.

AND AVIATION INDUSTRIES

Industry Men, Educators Air Problems at a Forum

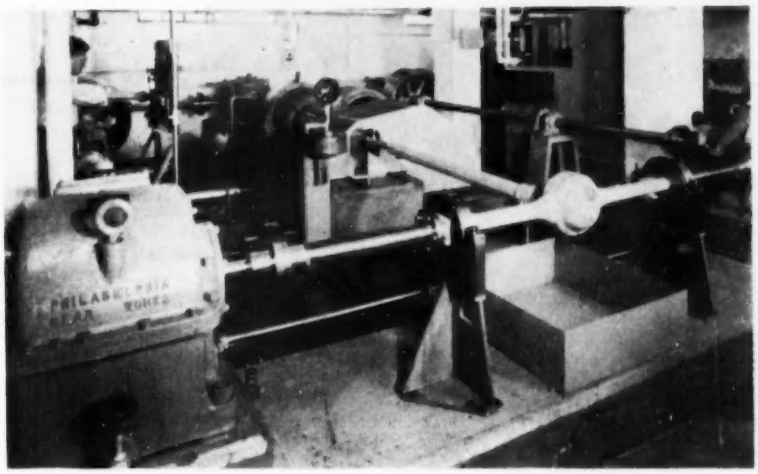
Automobile industry officials are re-appraising their educational relations programs after their forum with several hundred of the nation's educators at Rensselaer Polytechnic Institute last month. Sponsored jointly by R.P.I. and members of AMA, the meeting brought together nearly 1200 educators and industry representatives for talks and panel discussions on the history, operations, problems, and trends of the automobile industry.

Topics discussed in the panels included: anti-trust and monopoly trends; high horsepower engines; safety; highways; labor relations; automobile prices; competition; truck taxation; engineering and research; market saturation; economics of wages and car prices; plant location in relation to national defense; social responsibilities of the industry; and many more.

Monopoly Question

Hottest topic of the first day's discussions were anti-trust and monopoly activity on the part of the Justice Dept. growing out of statements from the Attorney General. General Motors spokesmen reiterated the company's position that public preference accounted for the company's dominant position and that the customer would decide the issue. Ford, a non-member of AMA, was not present to comment.

An interesting development was the position of the independents in answer to questions about monopoly and competition. Their spokesmen went on record as being opposed to any Government intervention and repeated previous assertions that there is a place for the independents because of their ability to provide specialty vehicles and features in regular automobiles that are not available from large companies.



TEST RIG FOR GEAR LUBRICATION DATA

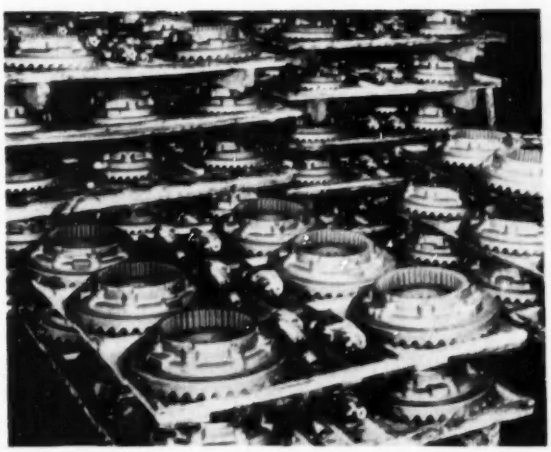
Two engineers check the hydraulic loading device of a unique hypoid rear axle test machine at the Beacon Laboratories of the Texas Co. The four-square loading test device permits a variety of simulated road, speed, and load conditions to be set up for the study of hypoid gear lubricants.

Prices and Extras

Another subject getting a great deal of attention was the matter of car prices, which the educators indicated were very high, and the relation of increasing wage rates to prices of automobiles. Panel spokesmen pointed out that car prices have not risen as much as many other commodities and, in the event that prices prove an impediment to sales, a ceiling may have to be put on wages.

Another related question was the implied criticism by the educators that present cars are too fancy, too loaded with gadgets and chrome, thereby increasing the price beyond the reach of average buyers. Panel members were quick to point out that the trend, when the buyer has a free choice, is toward the higher-priced, fancier models.

Horsepower and safety also received considerable working over at the discussion. The educators apparently questioned the higher horsepower trend. Panel members explained that there was not necessarily any correlation between higher horsepowers and the accident rate, and that actually there is a safety factor because of increased maneuverability.



LIFESAVERS

Carrier protection for its matching pinions and gears has been provided by the Axle Div. of Eaton Mfg. Co. through a novel method. Special pallets hold six sets, and the total load weighs 600 lb. Slots on the pallet are so arranged that matching units line up next to each other, thus preventing scratching and nicking.

News of the AUTOMOTIVE

Le Roi Model TLF-150 front end loader.

GM Resurrecting Its Livonia Site

Speculation about General Motors' plans for its Livonia, Mich., plant, destroyed by fire last August, is answered in part by announcement that a new plant will be built there for Fisher Body Div.

The new plant will measure 628,000 sq ft and will be added to approximately 200,000 sq ft of area left undamaged by the fire. Total production space will thus amount to 920,000 sq ft. In addition, 92,000 sq ft of undamaged area will be used for offices and other non-production purposes.

GM has not disclosed what will be produced by Fisher at the new plant other than to confirm that it will not be complete bodies. It is understood that body components will be turned out there.

Chrysler Quarterly Net Is Put at $7.6 Million

Total sales, profits, and production of Chrysler Corp. during the first quarter of 1954 showed a sharp drop compared with a year ago. Sales during the quarter declined to $529.476 million from $924.257 million in the same period last year. Profits, including those of foreign subsidiaries, dropped sharply from $24.428 million to $7.681 million. The net represented 1.45 per cent of sales, compared with 2.64 per cent in last years' first quarter.

Shipments of cars and trucks declined from 379,692 units to 228,087. The figure includes both foreign and domestic shipments.

Defense work, which accounted for 21 per cent of total sales in the first three months of 1953, fell to 15 per cent this year. The Chrysler report also showed expenditures of $15.589 million during the quarter for equipment, improvements, and additions to plants.

Move to Standardize Tags Makes Headway

The campaign for standardized license plate sizes initiated by the American Association of Motor Vehicle Administrators is making progress. The new standard, adopted officially last October, specifies a standard six by 12 in. plate for the 65 states, provinces and territories represented in the U. S., its possessions, and Canada.

Already 42 of the 65 jurisdictions have agreed to adopt the new standard on or before Jan. 1, 1956, the target date. In addition, another 17 have given informal indications that they will adopt the standard soon.

Adoption of the uniform six by 12 specification would make it possible for automobile designers to include special recessed compartments, possibly under glass, for license plates.

Le Roi Loaders Have Torque Converters

The Transo Div. of Le Roi Co. is now offering front end loaders in several sizes that feature torque converter, power steering, and reversing planetary transmission as standard equipment. The new units, which will be sold through Le Roi's Construction and Mining Div., range in size from ½ yard to 1½ yard capacity.

Bucket-rocking action and the scooping motion of the lift arms are said to assure full bucket load without tire spinning and other undue strain on the loader.

The former feature results from the rocking motion of the hydraulic cylinders, which are placed well back out of the dirt agitating area on the machines.

The TLF-150 unit (see cut) moves to discharge points at speeds ranging up to 18 mph. Four-wheel drive and low center of gravity reportedly put powerful traction on all four wheels of this unit to boost production and eliminate tire slippage. The loaders are powered by Le Roi engines and are available with Diesel powerplants also.

Tubeless Tire Talks Gaining New Impetus

U. S. Rubber Co. has added its voice to predictions by other large tire builders that tubeless tires will be standard equipment on some 1955 model cars. It now is shipping a new tire that can be supplied in either the conventional tube type or in the tubeless version. Both types of the new tire also will be available as replacement equipment throughout the country.

An important fact is that the tubeless version of the tire sells for about the same price as the conventional tire and tube combination. Previously higher cost of tubeless tires has been a stumbling block to adoption by car manufacturers for standard equipment. Other major manufacturers also are said to have plans to produce tubeless tires at a comparable price and to have adequate capacity to meet requirements of the car makers.

AND AVIATION INDUSTRIES

SYNTHETIC SUNLIGHT

Intensity of sunlight in various climatic zones is duplicated by this testing device in the research laboratories of Hudson Motor Car Co. Samples of upholstery fabrics, trim materials, plastics, and paint finishes are subjected to high-intensity periods in the Fade-O-meter, which measures resistance to fading and deterioration under extreme sunlight conditions.

Production Rate At High Levels

Although independent automobile makers continue to have troubles and production is trailing behind last year's rates, several car divisions are setting records and others may do the same before the second half draws to a close. Up until the middle of May, production was well over two million units. The Big Three continue to be the main bulwarks in producing more than 95 per cent of the total cars thus far this year.

It appears likely that the high production rate of Chevrolet, Ford, Buick, Oldsmobile and Cadillac, which brought April's output to over 500,000 for the best month in almost a year, will continue at its present pace. However some makers are reluctant to step up their schedules further.

New car sales, as reflected by registrations, have increased steadily since January, and the sudden increase in March brought the first quarter total to 1,191,021 units. This made the first three months of this year the third best quarter in history, according to the history books.

AI TABLOID

Fleet Manufacturing, Ltd., and Doman Helicopters, Inc., have formed a jointly owned Canadian subsidiary to build the LZ-5 helicopter in Ft. Erie, Ont. The concern will be known as Doman-Fleet Helicopters, Ltd.

* * *

Eaton Manufacturing Co. has created a new Aircraft Div., located in Battle Creek, Mich. . . . Clark Equipment Co. has formed a new subsidiary to finance leasing of its equipment on a national basis.

* * *

Young Radiator Co. is celebrating its 25th anniversary this year with the theme "25 Years Young."

* * *

Rolle Manufacturing Co. has been licensed to use the Fairchild A1-Fin and the Osbrink casting processes. . . . Standard Oil Development Co. is leasing to other companies its new "hydrofining" petroleum refining technique.

* * *

Westinghouse Electric Corp. recently broke ground for its new Blairsville, Pa., plant. . . . Pilot operations are now underway in a new Goshen Rubber Co. plant for fabricating silicone parts.

* * *

Du Pont has given the new trade-mark "Zytel" to its nylon resin.

* * *

Directors of Mathieson Chemical Corp. and Olin Industries, Inc., have approved a proposal to merge the two firms. . . . General Precision Equipment Corp. has acquired most of the stock of Link Aviation, Inc. . . . Garrett Corp. has assumed ownership of Aero Engineering, Inc., Aero Sales Engineering, Ltd., and Air Cruisers Co.

* * *

Wayne University is sponsoring a conference on training personnel for the computing machine field to be held June 22 and 23.

Reynolds Metals Co. has completed its new $1.75 million aluminum merchant mill at Sheffield, Ala. . . . Rockwell Manufacturing Co. has opened its huge new meter and valve testing station at Pittsburgh, Pa.

* * *

Formal separation of Chance Vought Aircraft, Inc., from United Aircraft Corp. is set for July 1. . . . Boeing Airplane Co. has announced that construction of its $10 million flight test facilities for B-52 bombers at Larson Air Force Base will begin in September.

* * *

McCulloch Motors Corp. recently purchased Lemery Distributors, Ltd., Canadian wholesaling firm.

* * *

Lear, Inc., has moved its headquarters from Grand Rapids, Mich., to Santa Monica, Calif. . . . Mercury Manufacturing Co. has moved its New York sales and service branch from Manhatten to Hasbrouck Heights, N. J.

* * *

Knapp Mills has announced plans to produce large-scale chemical and process equipment from rigid unplasticized polyvinyl chloride.

* * *

Expansion programs at its Wilmington, Calif., and Tulsa, Okla., refineries are being launched by the Texas Co. . . . Douglas Aircraft's Santa Monica Div. is undertaking a 400,000 sq ft expansion of its facilities.

* * *

The Air Force and Republic Aviation Corp. have announced the maiden flight of the Republic experimental YF-84J atomic fighter-bomber.

* * *

Clevite Corp. has granted rights to Repco, Ltd., Australia, for the manufacture of automotive bearings covered by Clevite patents.

News of the AUTOMOTIVE

ITALIAN DIESEL TRUCK

The new Bianchi Audax truck has a wheelbase of 10 ft., 7.33 in., front tread of five ft., 6.45 in., and rear tread of five ft., four in. The four-stroke direct-injection Diesel engine has four valves in each cylinder head and a maximum output of 84 bhp at 2000 rpm. Bore is 110 mm, stroke 140 mm, and total cylinder capacity 5320 cc.

Car Firms Studying Rear Axle Changes

Some automobile companies, which have greatly increased horsepower and torque of their engines, now are taking a look at rear axles to determine whether some modifications may be necessary to take care of the greater power output.

There has been no serious trouble on this score yet, but one or two companies report some noise problems. They indicate that some design modifications or "beefing up" may be necessary to balance rear axles with the greater torque loads of more powerful engines used currently.

Tung-Sol Electric Marks 50th Year in Business

Launched a half century ago in a small back room in New York City, Tung-Sol Electric, Inc., today ranks as the second U. S. manufacturer of all types of miniature lamps and stands fourth in the overall production of electron tubes. About 500 different types of products are turned out now by 5700 workers in the company's seven New Jersey and Pennsylvania plants.

Tung-Sol started in the miniature lamp business in 1904, and by 1907 had developed a practical small electric lamp for automobile headlights. At the present time, as many as 32 varying types of Tung-Sol lamps are used in all kinds of highway vehicles, as well as in ships and aircraft.

Once in the automobile lamp business, Tung-Sol moved ahead with the industry. It was largely responsible for the "Tulite" dual filament lamp for cars, which made its appearance as factory equipment on some automobiles in 1919. While instrumental in the development of the sealed-beam headlamp, the company also pioneered the flasher mechanism for automotive directional signaling equipment.

Although Tung-Sol has devoted an increasing proportion of its efforts to the electronics field since the end of World War II, it has retained a position of leadership in the automotive lamp field. It was, for example, a participant in the development of the GM "Autronic Eye."

J&L Is Making Tin Plate for Automobile Industry

At a recent stockholders' meeting, Jones & Laughlin Steel Corp. disclosed that it is producing electrolytic tin plate in heavy gages for the automobile industry. It is being furnished mainly for the fabrication of air cleaners, oil filters, and other stamped parts at the present time.

Numerous Methods Aired At Welding Conference

Welding automobile body steel, and brazing molybdenum and titanium were some of the topics covered at the spring meeting of the American welding Society in Buffalo last month. About 7500 engineers registered for the technical sessions and the exhibition of welding tools and accessories.

Series or multiple spot welding of 0.036-in. low carbon body steel was discussed in a paper by E. F. Nippes of Rensselaer Polytechnic Institute and F. H. Domina of General Electric Co. They covered equipment to produce two to 16 welds in even multiples, at one time, and pointed out the effect of variables on tension-shear and peal tests.

An arc spot welding process, for large panels where a resistance welder cannot reach both sides, was outlined by C. A. McClean of Air Reduction Sales Co. Shielded arc welding of carbon steels, previously used for nonferrous metals, is faster and eliminates slag and spatter, according to J. R. Craig of Linde Air Products Co.

Furnace brazing of titanium is feasible with nickel-titanium alloys which give ultimate shear strengths of 40 to 70,000 psi, said R. A. Long and R. R. Ruppender of Ferrotherm Co. Several brazing methods for molybdenum for high-temperature service were investigated by M. I. Jacobson and D. C. Martin of Battelle Memorial Institute.

Smaller Electronic "Brain" Is Offered by Burroughs

Burroughs Corp. has bought out a smaller electronic "brain," which, it claims, can solve routine scientific and engineering problems at high speeds. Called the E101 electronic computor, the machine will sell for about $30,000.

Burroughs says that anyone can operate the new machine, which can add two 12-digit numbers in two-thousandths of a second, and multiply, subtract, and divide. The "baby" computor reportedly can "memorize" interest rate tables, logarithms, and other information required in working out problems, just as larger machines do.

AND AVIATION INDUSTRIES

Auto-Lite Sales Drop Sharply in Quarter

The first-quarter report of Electric Auto-Lite Co. illustrates the impact sales of automobile companies have on their suppliers. Auto-Lite, which gets more than half of its total volume from Chrysler and the independent car makers, has reported that its sales during the first three months of this year dropped sharply to $49.481 million from $76.614 million in the comparable period of 1953. Profits also slumped from $2.949 million in the 1953 quarter to $397,985 during the 1954 quarter.

Short White Diesel Tractor Has Tilted 200-hp Engine

Maximum payload due to light weight (11,650 lb), high cubage, and top horsepower are said to be prime advantages in a new series of Diesel tractors announced by White Motor Co. The first of the new tractors, Model WC-24TD with Diesel, is now in production.

Powered by 200-hp Cummins Diesel engines, the tractors have a 96-in. dimension from the front of the bumper to back of the cab. Another model will be available with a 175-hp Cummins Diesel.

In order to incorporate the 200-hp engine in the short WC-24TD Model, White engineers designed a new frame mount which placed the engine as far forward as possible and tilted it 20 deg. It is mounted off to the right so that there is a small projection of the rear of the engine on the right side of the cab floor.

Furthermore, in order to get the engine into the proper tractor cab dimensions, the front of the frame was lowered eight in. Standard frame height was kept under the rear axle.

Two-Way Radio Accelerates Plant's Material Handling

A two-way radio-telephone system installed in the cabs of electric fork-lift trucks has increased material handling efficiency about 30 per cent at Chrysler's new Indianapolis plant. Without moving from his truck, a driver answers the phone and receives instructions from a dispatcher in a centrally-located office as to what type of stock is needed on the line, where he can pick it up, and where to drop it off.

The company says that the new system also eliminates "empty runs." The fork lift truck can now make up to 110 trips per shift, compared with 80 full-loaded trips previously.

Price Cuts Are Predicted On Power Steering Units

Another cut in the price of power steering to below $100 as optional equipment on some GM cars and possibly others is forecast by W. H. Doerfner, general manager of GM's Saginaw Steering Gear Div. Due to increasing volume, the price of GM's unit already has been reduced about $50 from the $185 tag put on the unit when it was introduced in 1952.

The lower price forecast for some cars indicates that Chevrolet and probably Pontiac might go to the linkage booster type which GM has tooled to produce and which it now supplies to Hudson. Studebaker also uses the GM integral type gear, and it also might possibly adopt the linkage booster type.

Doerfner also revealed that GM has developed a greatly simplified, smaller integral type gear which will go into limited production later this year. The unit has only 49 parts and weighs 38 lb. It is expected to be adopted by Cadillac, Lincoln, and probably some Oldsmobile and Buick models in 1955.

The GM official also predicts that within three years about 75 per cent of all new cars produced will have power steering on either a standard or optional basis. At the present time, more than 22 per cent of all of GM's production is equipped with power steering. During April production was at the highest level in history with more than 77,000 units.

Twin Coach Announces Parcel Delivery Truck

Twin Coach Co. has announced a new midget-size, multi-purpose right hand stand-drive parcel delivery truck, known as the Fageol "Pony Express," it is said to be suitable for all types of delivery operations.

The truck is powered by a 55-hp, four-cyl Continental engine coupled to a Detroit Gear automatic transmission. The interior has been designed for easy access to the load area.

Continued on Page 98

MARCH LOW-PRICED CAR SALES UP 7% OVER 1953

1954 Retail Car Sales By Price Groups*

Number of Cars

	March				Three Months			
	1954		1953		1954		1953	
Price Group	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	275,910	57.62	259,182	53.61	696,072	58 69	676,418	53 65
$2,001 to $2,500	124,894	26.08	136,059	28.14	312,625	26 35	352,486	27.96
$2,501 to $3,500	57,118	11.93	68,697	14.21	124,471	10.49	177,568	14.08
Over $3,500	20,906	4.37	19,522	4.04	52,939	4.46	54,300	4.31
Total	478,828	100.00	483,460	100.00	1,186,106	100.00	1,260,772	100.00

Dollar Volume of Sales*

	March				Three Months			
	1954		1953		1954		1953	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$502,344,088	48.95	$465,869,534	45.00	$1,267,670,225	50.28	$1,217,061,648	45 02
$2,001 to $2,500	285,897,109	27.86	306,115,838	29.58	713,185,574	28.28	790,902,564	29.26
$2,501 to $3,500	157,160,759	15.31	189,588,439	18.32	339,123,571	13.45	487,277,675	18.02
Over $3,500	80,893,068	7.88	73,446,475	7.10	201,493,794	7.99	206,161,311	7.70
Total	$1,026,295,024	100.00	$1,035,020,286	100.00	$2,521,473,164	100.00	$2,703,423,218	100 00

* Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
† New registrations of American made cars only. Does not include imported foreign cars.

Men in the News

Twin Coach Co.—John J. Lee has been elected executive vice-president.

Birdsboro Steel Foundry & Machine Co.—**John E. McCauley** was elected chairman of the board and chief executive officer; **G. Clymer Brooke**, president; **James M. Heppenstall**, vice-president and treasurer; and **Arlan L. Wentzel**, vice-president and works manager.

American Motors Corp.—**Edward L. Cushman** has been appointed director of industrial relations.

Electric Auto-Lite Co.—**James P. Falvey** has been elected executive vice-president.

Studebaker Corp.—**C. K. Whittaker** has been appointed an executive vice-president.

Plymouth Div., Chrysler Corp.—**Kenneth M. Huddleson** was appointed comptroller.

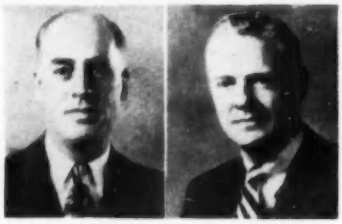
Oldsmobile Div., General Motors Corp.—**Elliott M. Estes** has been appointed assistant chief engineer in charge of body and chassis design and engineering standards. He is succeeded as body engineer by **Donald C. Perkins. John Beltz** has been advanced to experimental engineer.

General Motors Corp.—**William L. Mitchell** has been made director of the styling section, succeeding **Howard E. O'Leary**, retired.

Miller Fluid Power Co.—**Richard M. Morgan** has been placed in charge of production tooling, production engineering, and plant layout.

Joseph T. Ryerson & Son, Inc.—**James M. Mead** has been elected a vice-president and director, while **Russell L. Peters** was elected to the board. **James A. Munro** was made assistant manager of the Structural Fabricating Div. at the Chicago plant, and **Robert H. Hering** succeeds him as Work Order Dept. manager at Detroit.

Chrysler Corp.—**George T. Higgins** is now assistant secretary.



Dana Corp.—D. D. Robertson has been promoted to director of sales, while Charles C. Dybvig is now general sales manager of the organization.

Purolator Products, Inc.—**Joseph G. Van Nest** has been appointed vice-president in charge of purchasing, and **Herbert W. Thogode** has been made a director and secretary-treasurer.

Jack & Heintz, Inc.—**Charles W. Sanford** was elected vice-president for manufacturing, and **John E. Ault, Jr.**, has assumed the post of comptroller.

R. K. LeBlond Machine Tool Co.—**R. J. Reif** has been appointed advertising manager.

Industrial Brownhoist Corp.—Milton C. Sapinsley, founder and supervisory general manager of the Crescent Co., has been elected to the board of directors.

General American Transportation Corp.—**Sam Laud** was elected vice-chairman of the board; **William J. Stebler**, president; **Herman Altschul**, vice-president in charge of freight car sales; **James S. Frey**, a director and vice-president in charge of manufacturing; and **Frank E. Selz**, vice-president in charge of the Plastics Div. **Spencer D. Moseley** was named assistant to the president.

Bullard Co.—**Maxwell R. Warden** was elected a member of the board.

United Aircraft Products, Inc.—**Edward L. Ladd** was named executive vice-president, and **Joseph T. Morris** was advanced to vice-president.

Mack Trucks, Inc.—**C. A. Johnson, Harold L. Fierman,** and **Stuart Hedden** were elected directors.

American Machine & Foundry Co.—Rodney C. Gott has been named executive vice-president.

Borg-Warner Corp., Pesco Products Div.—**Robert G. Allen** has been appointed president and general manager.

Vickers, Inc.—**Ray C. Conner** has been chosen to head the new automotive products sales group.

Sealed Power Corp.—**Gordon E. Reynolds** was elected secretary-treasurer and a member of the board; **Rick E. Murbarger**, vice-president in charge of sales; and **Donald M. Hesling**, vice-president in charge of engineering and manufacturing.

International Nickel Co. of Canada, Ltd.—**Henry S. Wingate** was elected president, and **F. M. A. Noblet** was chosen treasurer.

Minneapolis-Honeywell Regulator Co., Micro Switch Div.—**R. R. Jenner** has been appointed director of airborne products.

Alan Wood Steel Co.—**Harleston R. Wood** has been elected vice-president in charge of planning and development.

Westinghouse Electric Corp.—**Walter J. Maytham, Dale McFeatters,** and **Otis O. Rae** have been elected vice-presidents, while **E. V. Huggins** has been named secretary, succeeding **C. W. Pomeroy**, retired.

Pennsylvania Salt Mfg. Co.—**Eugene J. Harrington, Jr.**, has been made secretary, and **Frederick J. Emmenegger** is now controller.

Surface Combustion Corp.—**Carroll Cone** has been made chief engineer of the Industrial Divs., and **William H. Dailey** has been chosen chief engineer of the Steel Mill Div.

Hydropress, Inc.—**Hugo Lorant** has been elected senior vice-president, while **Paul Mayer** has become assistant vice-president.

Bolta Products—**William Murphy** has been made assistant production manager.

Chrysler Corp. — C. G. Eschenbach has become director of employment and employee services.

Detroit Aluminum & Brass Corp.—William E. O'Reilly has been made vice-president.

Detroit Gear Div., Borg-Warner Corp.—A. H. Schmal has been appointed chief engineer.

H. K. Porter Co., Inc.—**W. Harvey Thompson** has been named assistant to the executive vice-president.

Allis-Chalmers Manufacturing Co., General Machinery Div.—**R. C. Allen** is now director of mechanical engineering, and **L. J. Linde** has become director of electrical engineering.

Fairchild Engine & Airplane Corp., Engine Div.—**Frank J. Hahn** has been appointed assistant director of quality control.

Borg-Warner Corp., Ingersoll Products Div.—**Fred Combert** was made Norge Heat product manager.

Bull Dog Electric Products—**Henry C. Egerton** was elected a director.

Chrysler Corp., Automotive Body Div.—**E. D. Davison** has become factory auditor.

Ford Motor Co., Tractor & Implement Div.—**E. B. Holst** has been chosen manager of the new Engineering Administration Dept.

Consolidated Engineering Corp.—**Franklin H. Donnell** has been appointed vice-president in charge of finance.

Rem-Cru Titanium, Inc. — **Dwight W. Kaufmann** is now eastern sales manager, while **George T. Fraser** is western sales manager.

Feedall Machine & Engineering Co. —**John Pecek** was made sales manager.

Vanadium-Alloys Steel Co., Colonial Steel Div.—**Lawrence E. Moore** was elected secretary-treasurer.

Rubarite, Inc.—**Joseph Sterling** has been made manager in charge of industrial accounts.

Pittsburgh Gear Co.—**J. E. Mullen** has been appointed general sales representative.

Gould-National Batteries, Inc., Autostarting Div.—**Ralph I. Bost** has been made chief engineer.

Bassick Co.—**Joseph T. Foerth** has been elected a vice-president.

Lipe - Rollway Corp. — **Edgar N. Mather** has become machine tool sales engineer for the mid-west and east-central sales areas.

Vickers, Inc.—**Thomas B. Doe, Jr.,** has been chosen master mechanic.

Chrysler Corp.—**F. V. Olds** has been appointed assistant comptroller.

Minnesota Mining & Mfg. Co.—**B. B. Countryman** was elected vice-president of the Purchasing Div., and **I. R. Hansen** was selected as assistant treasurer.

Galion Allsteel Body Co.—**R. H. Tomlinson** is now Eastern Div. sales manager.

U. S. Spring & Bumper Co.—**C. E. Root** has been named vice-president.

Chrysler Corp.—**A. Griswold Herreshoff,** executive engineer in charge of development design, has retired.

Westinghouse Air Brake Co.—**James A. Carlson** has been appointed assistant vice-president for sales coordination. **Joe H. Serkowich** has been made director of advertising.

Gardner Machine Co.—R. E. Price has been named general manager.

LeTourneau - Westinghouse Co.—**Lloyd A. Rager** has been named advertising manager.

Norton Co.—**Raymond M. Rebert** has become chief chemist in charge of the chemical section of the Research and Development Dept.

Copperweld Steel Co.—**James M. Darbaker** has become senior vice-president and a member of the board.

International Harvester Co., Motor Truck Div.—**V. I. Pearson** has been named general supervisor, used truck merchandising.

Babcock & Wilcox Co., Tubular Products Div.—**Henry W. Doctor** is now Cincinnati district sales manager.

Pittsburgh Plate Glass Co., Pacific Coast Paint Div.—**Herschel E. Post** has been appointed general manager.

Amplex Div., Chrysler Corp.—**A. H. Merschel,** assistant to the president, retired.

Bonney Forge & Tool Works, Tool Div.—**O. E. Williams** has been named research and design engineer.

Pennsylvania Salt Mfg. Co., Chemical Specialties Div.—**Alfred H. Pope** has been named product supervisor for metal cleaners.

Ford Div., Ford Motor Co.—**Philip N. Buckminster** was named manager of the Market Area Analysis Dept.

Collins & Aikman Corp., Automotive Upholstery Div.—**Robert Stroker** has been named sales manager.

White Motor Co.—**John C. Lewis** has been named contract maintenance supervisor.

Ford Motor Co., Tractor & Implement Div.—**Vernon E. Nickel** has been appointed manager of the Tractor Sales Dept., and **Thomas C. Heydon** has been made manager of the Sales Research Dept.

Necrology

Royce G. Martin, 69, president and chairman of the board of The Electric Auto-Lite Co., died May 1, at Lexington, Ky.

Lorenzo L. Snow, 68, manager of the Airport Dept., Pratt & Whitney Aircraft Div., United Aircraft Corp., died May 7, at West Hartford, Conn.

Jacob K. Lasser, 57, well-known tax expert and author, died May 11, at New York, N. Y.

Alfred G. Gulliver, 73, retired general manager of all three Chevrolet plants in Buffalo, N. Y., died May 3, at Daytona Beach, Fla.

T. Latimer Ford, manager of the Sales Planning and Control Section, Metal Products Div., Koppers Co., Inc., died April 28, at Baltimore, Md.

Which Through-Hardening Grade of Alloy Tubing Is Best for You?

...B&W Can Supply Them All

For applications of mechanical tubing that require high strength, ductility, and resistance to impact, the medium-carbon, through-hardening steels are particularly suitable. A correlation of the properties of each available grade with your product specifications will help you determine the grade most suitable for your operation. Listed are the medium-carbon alloy steels typical of those that can be heat-treated to meet a broad range of mechanical properties. These steels all contain alloying elements introduced to provide a desirable combination of strength and ductility and to promote ease of heat treatment. In some grades the alloying elements also provide resistance to softening at higher tempering temperatures.

Tubing of these grades may be hot forged without difficulty by conventional methods, and in the softened state is readily machinable—a good indication of the workability common to all the medium carbon through hardening.

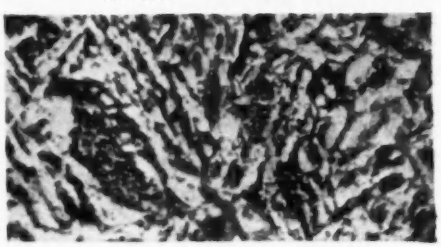
In the application of alloy tubing of these steels, it is often possible to use alternate grades without loss of desirable mechanical properties. You'll find Mr. Tubes—your link to B&W—always on call and invariably helpful in any discussion of your tubing requirements. You'll find B&W Bulletin TDC-141 helpful, too. Send for your copy today.

TYPICAL THROUGH-HARDENING GRADES

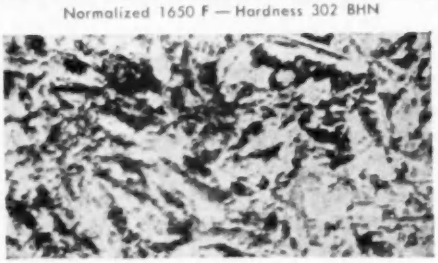
1340	2340	3140
4042	4140	4340
4640	5140	8640
8740	9440	

Typical Microstructures (at 1000 X) and Hardnesses, 4140 Steel

Hot Rolled — Hardness 285 BHN



Normalized 1650 F — Hardness 302 BHN



Normalized 1650 F and drawn at 1250 F for 1 hour — Hardness 217 BHN

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
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TA-4027 (ASM)

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Frankly, "Double Diamond" Gears aren't built to save you a few pennies today. They're engineered and manufactured to save you *dollars* in low installed cost, satisfactory performance and minimum service requirements *over the years.* Have you sharpened your pencil for that kind of economy? Then you will be especially interested in "Double Diamond" Gears. Why not write?

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FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

ESTABLISHED IN 1914

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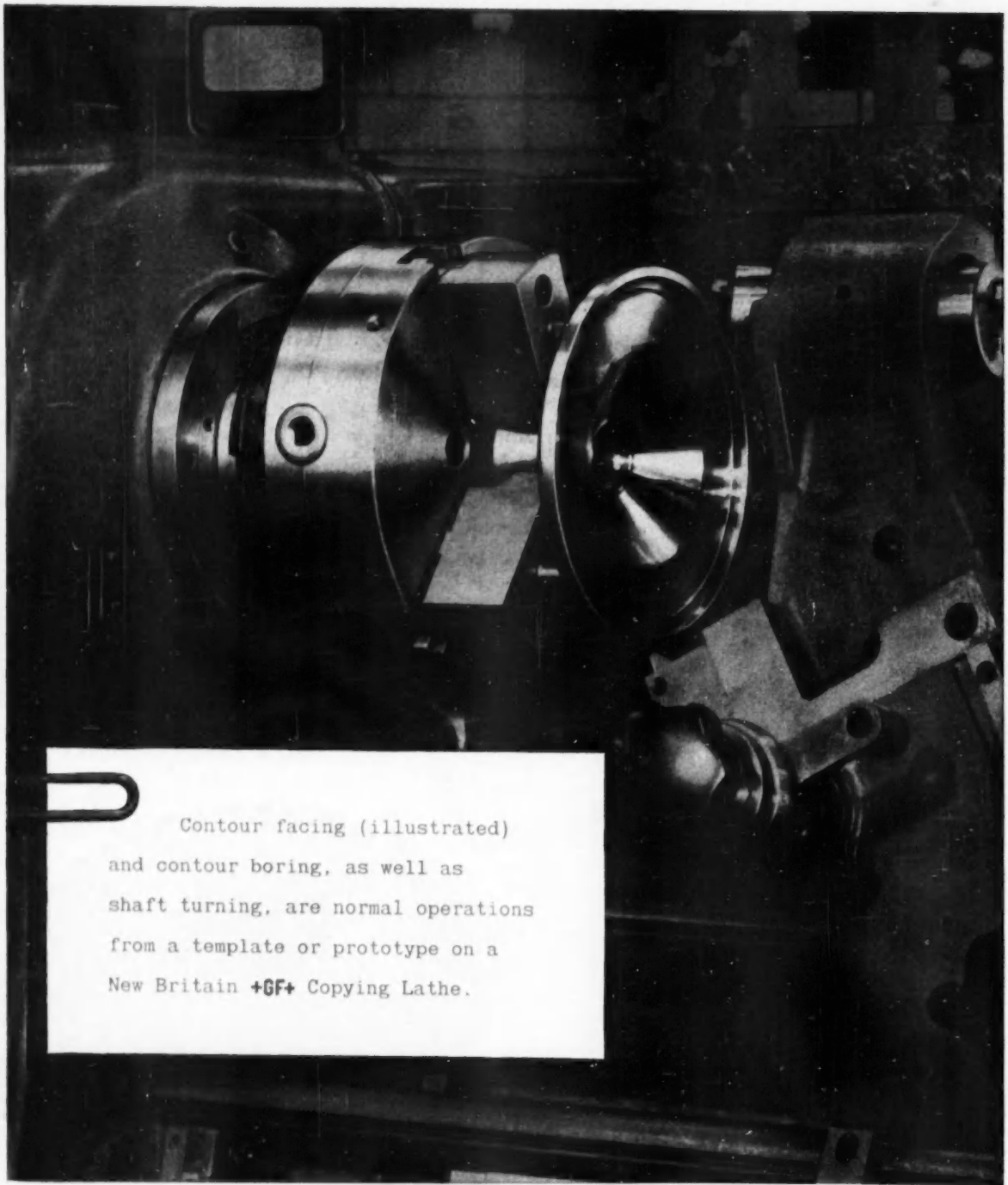


Contour facing (illustrated) and contour boring, as well as shaft turning, are normal operations from a template or prototype on a New Britain +GF+ Copying Lathe.

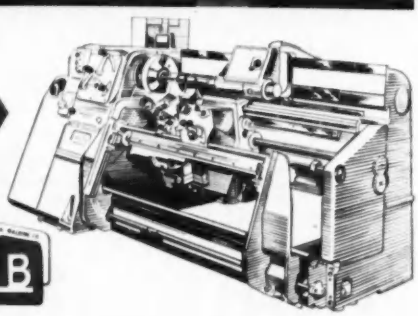
THE NEW BRITAIN MACHINE COMPANY

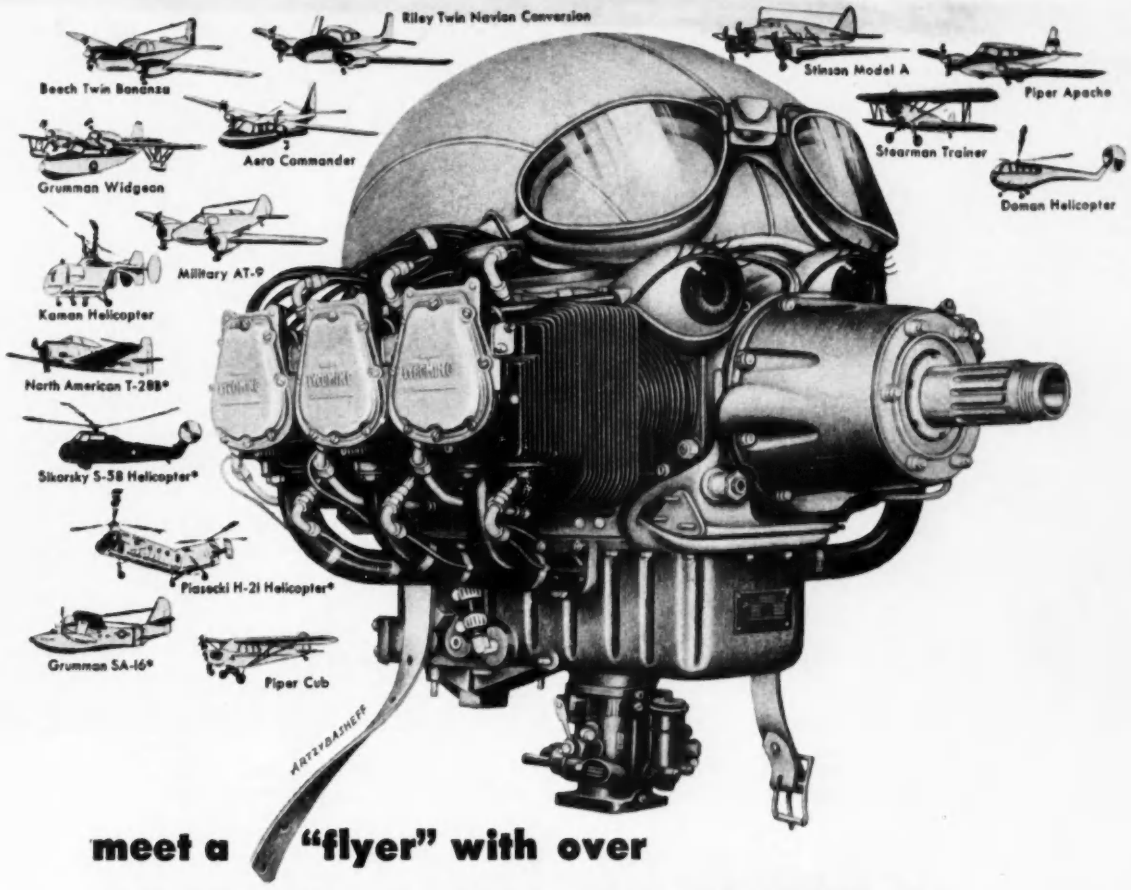
New Britain-Gridley Machine Division, New Britain, Connecticut

NEW BRITAIN *Automatics*

Machines for Making Progress

Automatic Bar and Chucking Machines
Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes





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You learn a lot about flying in 25 years . . . and 50,000 engines!

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Engineering Design and Development
Hardened and Ground Precision Parts
Gears and Machine Parts

Complete Assemblies
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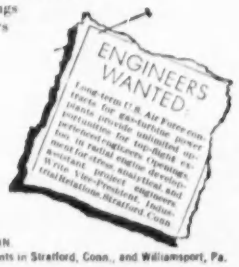
Steel Fabrication
Castings
Boilers



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LOOK TO **Lycoming**

DIVISION OF AVCO STRATFORD, CONN.
Manufacturing plants in Stratford, Conn., and Williamsport, Pa.

*Wright-Cyclone engine, built by Lycoming under license from Curtiss-Wright Corporation, Wright Aeronautical Division.

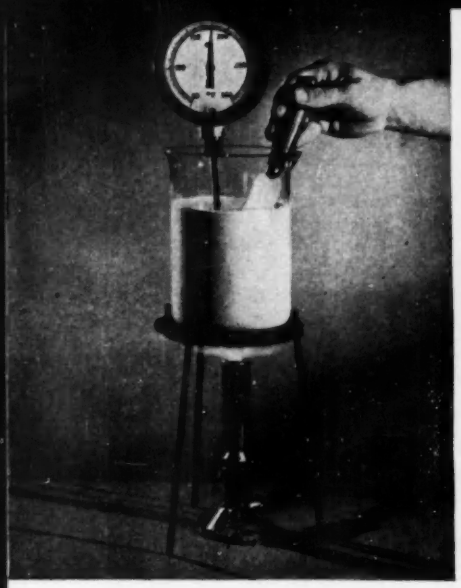
CUTTING. New S.E.C.O. keeps parts and tools cooler. Tools last longer, require fewer grindings; production is increased; finishes are uniformly good.

Now Better Than Ever!

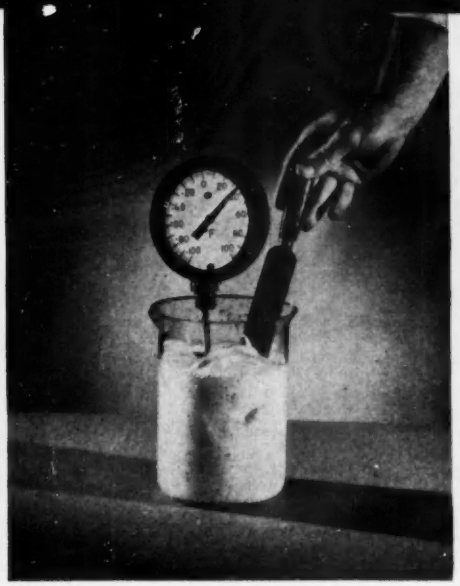
Sunoco Emulsifying Cutting Oil

New refining facilities improve industry's most widely used cutting oil and permit it to give these added benefits

- **HIGHER MACHINING EFFICIENCY**—better finishes, longer tool life, increased production in cutting operations
- **INCREASED DETERGENCY**—particularly important in grinding operations—provides better surface finishes, prevents loading and glazing of the wheel, prolongs wheel life
- **BETTER MIXING QUALITIES**—in hot, cold or hard water
- **A PURER, CLEANER CUTTING OIL**—whiter, more stable emulsions; cleaner parts and machines; better operator acceptance
- **EASIER HANDLING**—pumps from storage tanks more readily, flows from drums faster
- **GREATER VERSATILITY**—can be used for rolling, washing and rustproofing as well as cutting and grinding

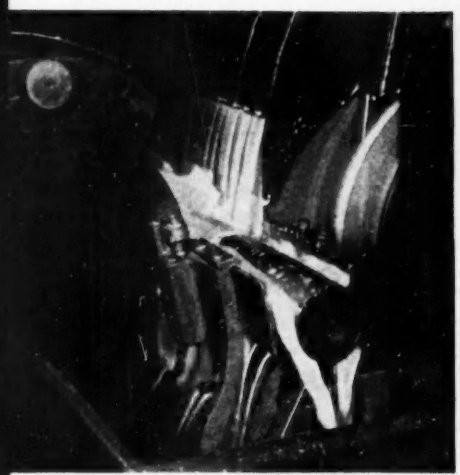


MIXES BETTER IN HOT WATER. New S.E.C.O. mixes and remains stable even at 180 F. This permits its use in washing and rustproofing.



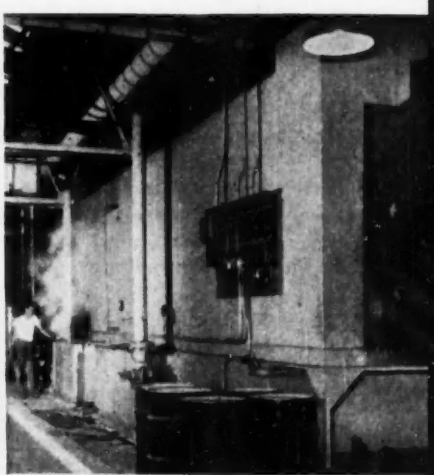
MIXES EASILY IN COLD WATER. New S.E.C.O. forms stable emulsions in the coldest water . . . even ice water does not affect it.

MIXES READILY IN HARD WATER. New S.E.C.O. eliminates the need for special hard-water grades of emulsifying cutting oil.



GRINDING. New S.E.C.O. improves surface finishes because its increased detergency prevents loading and glazing of grinding wheels, prolongs wheel life.

RUSTPROOFING. New S.E.C.O. is a better hot rustproofing medium. It forms stable emulsions, coats metal parts uniformly, protects them against rusting.



WASHING. Because of its increased detergency and its ability to mix and remain stable in hot water, New S.E.C.O. is better for removing grease and dirt from metals.

TEST THIS NEW S.E.C.O. IN YOUR OWN PLANT. For more information, call your nearest Sun office or write SUN OIL COMPANY, Phila. 3, Pa., Dept. AA-6.

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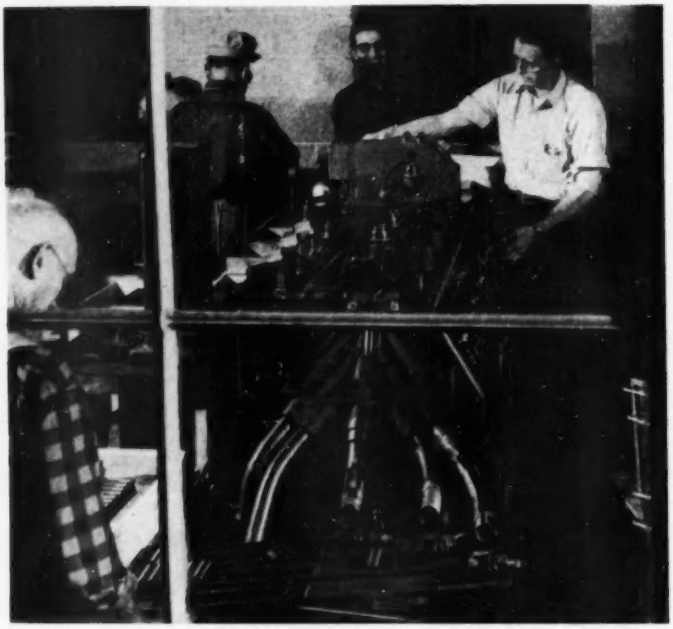
Made by the producers of famous Blue Sunoco Gasoline and Dynalube Motor Oils

Full Automation for Piston Pins

Batteries of Automatic Equipment Also Used to Machine Manifolds at Ford Engine Plant



Inspection of piston pins is done in this air-conditioned room using Merz electronic machines which automatically check six characteristics and sort the acceptable pins into three sizes. Perfect pins come out the chutes in foreground. Rejects go into boxes at left of machine.

By Joseph Geschelin

AUTOMATION in its most advanced form has been applied to the compact production lines for small parts such as piston pins in the Dearborn Engine Plant of Ford Motor Company. This article, the third of a series on the new overhead valve engine equipment at this plant, deals with a sampling of operations and includes some comment on the machining of Ford V-8 intake and exhaust manifolds which are finished at a high rate in Cross Transfer-matics.

Piston pins are produced by one of the most distinctive techniques to be found in the industry. By harnessing automation with some noteworthy Baker special machines and other equipment Ford has developed an economic method of producing pins directly from bar stock.

Special Ford Type N steel is received in bars, loaded into special Baker machines designed to cut off to length, drill from both ends, ream the inner bore from both ends, microfinish the inside diameter, chamfer the outer edges. This is done in a single, continuous cycle. All of the tooling on the battery of six Bakers is carbide-tipped, including reamers.

As the pins emerge from the Bakers, they are transported by a flight conveyor into an overhead hopper where the work is vibrated to shake out chips. Automation is arranged to deliver the pins from the hopper to a row of No. 5 Cincinnati centerless grinders for roughing. Then follows washing, hand loading into trays for a timed cycle in Holcroft carburizing furnaces. After carburizing the pins are quenched, drawn, washed, and again elevated into hoppers for further distribution.

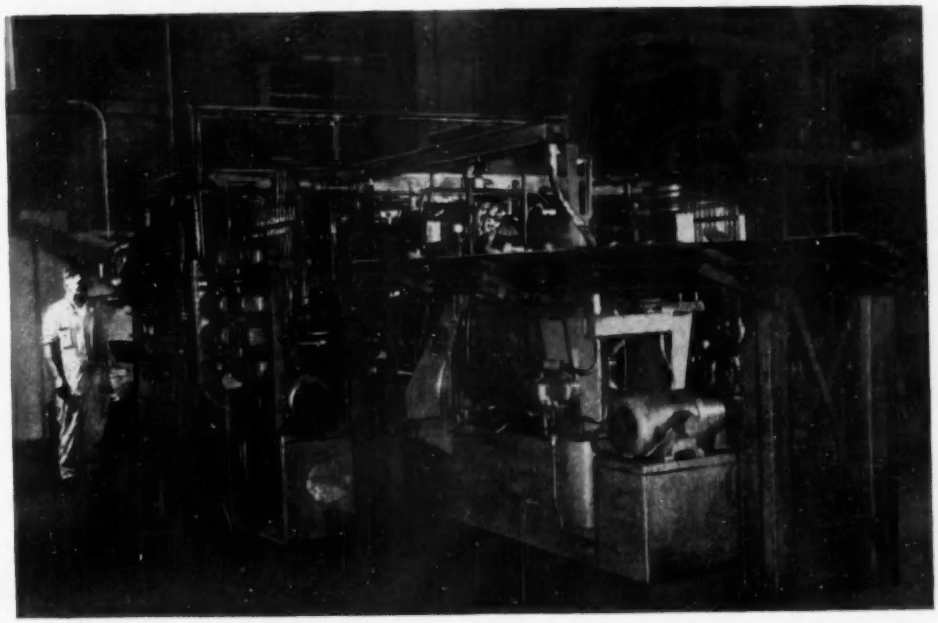
Each of these hoppers is arranged to feed two lines of Cincinnati centerless grinders for the finishing operations. Each row of grinders consists of five No. 2 Cincinnati centerless grinders, the last machine being a Cincinnati centerless lapper. Surface finish is rated as being of utmost importance and is held to six-microinch (rms). Surface finish is maintained so well in control that only hourly sampling checks are made with a Profilometer.

From the final grinding operation the pins are transported to an enclosed, temperature controlled booth for final inspection and sorting. This is done automatically in two Merz electronic machines, automatically checking for six different characteristics, and sorting accepted parts into three standard sizes. The Merz machine checks for size, length, chamfer, hardness, roundness, and taper; and rejects pins that fail to meet the specification in any respect.

Intake manifold machining has been organized in two stages—milling in one machine, then completing all detail machining operations in an automatic cycle in a large Cross Transfer-matic machine. It may be noted that the intake manifold for the OHV Ford V-8 engine is a large and rather complicated gray iron casting with over-and-under intake passages.

First operation is in a three-station Newton rotary type index milling machine, with loading and unloading at station one. The second station does the milling of the heater hose connection and carburetor pads with the vertical head; milling of the mounting flange on one side with a horizontal head. Station 3 mills the mounting flange on the opposite side with a horizontal head.

At this point the work is transferred to a 14-station Cross transfer machine which completes all of the remaining operations, consisting of the following: mill, drill, countersink, and tap



Piston pins are machined from bar stock in special Baker machines. These machines cut the pins to length, drill and ream a hole lengthwise through the pin, and microfinish that bore, then chamfer the outer edges in a continuous cycle.

Two intake manifolds are machined simultaneously in this 14-station Cross transfer machine. An integral conveyor carries the parts through the machine's 88 drilling, tapping and countersinking operations and through two milling cutters.

in water outlet; drill, countersink, and tap holes in carburetor pad and vacuum hole; mill and drill lugs; drill all holes in mounting flanges. The machine is provided with a platen type conveyor carrying individual fixtures which travel about a closed circuit, returning to the loading station. Each of the vertical fixtures on the conveyor holds two manifolds at a time.

The machine has 88 spindles in action plus two milling heads. As illustrated, it has heads in various positions, some vertical, most of them horizontal and aligned on both sides of the conveyor. The two machines installed for this operation are served by the well-known Cross Tool-O-Matic boards.

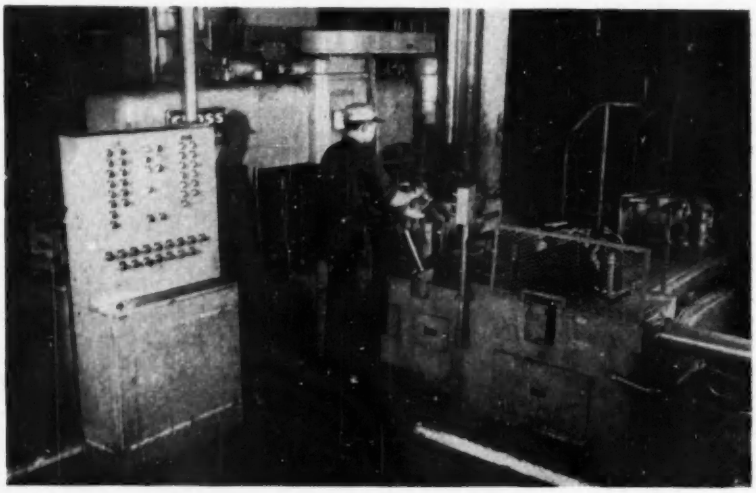
Following machining the intake manifolds are subjected to a special cycle of air testing in which each of three different chambers is checked individually. For this purpose they employ a five station transfer machine, having two stations for loading and unloading, three for the actual test operation. It tests progressively—the heating chamber, and two banks of intake chambers. For this purpose each chamber, in turn, is filled with air, sealed, and immersed in the water tank for evidence of leaks.

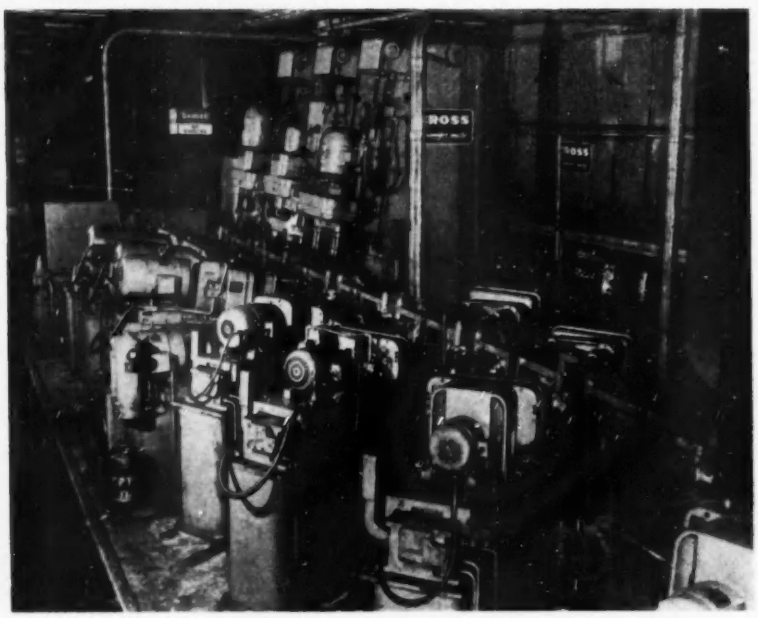
Exhaust manifolds, on the other hand, are finished completely in one cycle in a Cross 10-station Transfermatic, mounting a pair of manifolds on each fixture. Station 2 mills the mounting flange faces, using a two-spindle milling head; Station 3 drills 14 holes; Station 4 handles milling—finish-mills the cross-over pipe joint face on both parts with a two spindlehead on the right hand side, finish-mills the muffler pipe face on one part; Station 5 counterbores two holes at the right hand head, mills a slot in both parts with a two-spindle milling head; Station 6 drills four holes on the right

hand side, counterbores two holes on the left side; Station 7 chamfers four holes on the right side, drills two holes on the left; Station 8 taps four holes on the right side, chamfers two holes on the left; Station 9 taps two holes on the left side.

This machine has 36 spindles for drilling, reaming, and chamfering operations; seven spindles for milling. It too is served by a Cross Tool-O-Matic board.

More of the advanced automation techniques at Ford's Dearborn Engine Plant will be described and illustrated in an article to be published in a forthcoming issue of AUTOMOTIVE INDUSTRIES.





TOP—

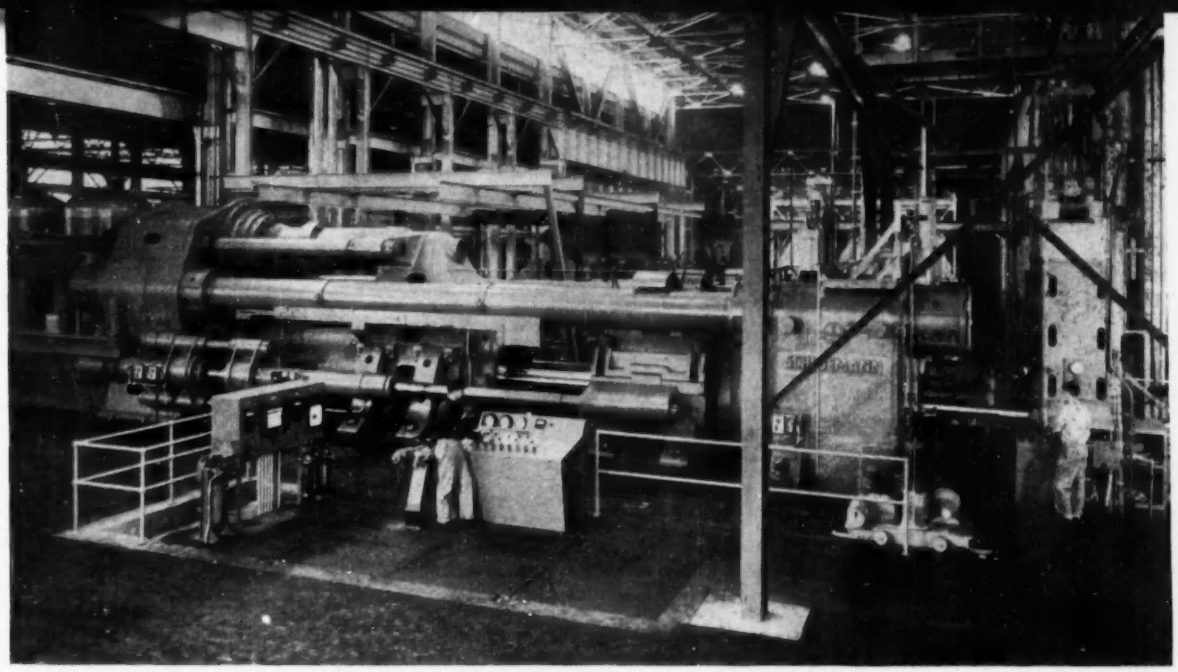
Two horizontal and one vertical milling cutter are employed by this Newton machine to face the surfaces of the Ford V-8 intake manifold. The three-station machine is loaded and unloaded at this station.

MIDDLE—

All machining operations on the exhaust manifolds are performed in Cross 10-station transfer machines. Mounting 36 drilling, reaming and chamfering spindles and seven milling spindles the tool has platen-type conveyor fixtures, each carrying two manifolds simultaneously through each station.

BOTTOM—

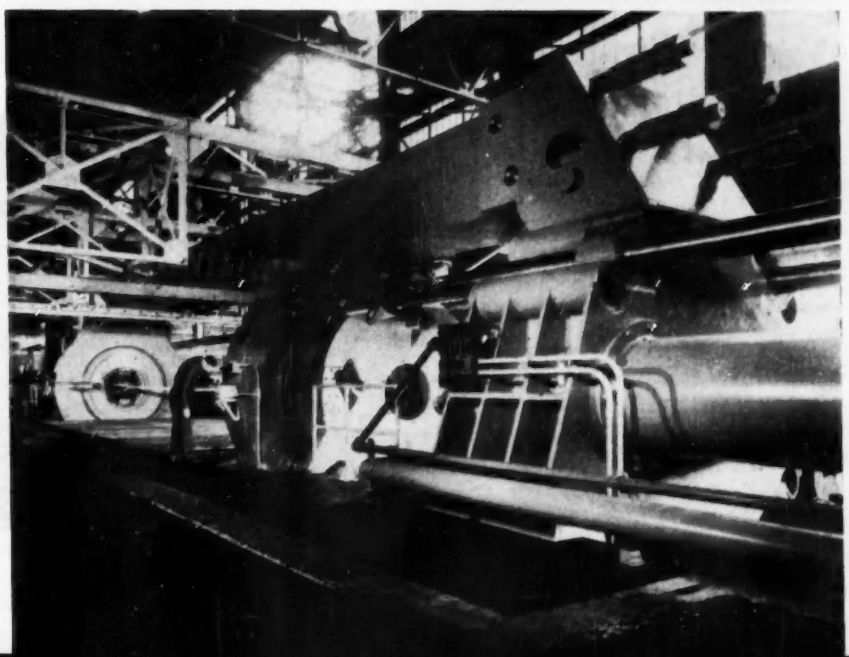
Overall view of the Cross Transfermatic which machines intake manifolds shows the arrangement of heads which work on several surfaces of the work-piece while its position remains fixed.



Over-all view of world's largest extrusion press. This 14,000 ton unit has just begun full production at the Lafayette (Ind.) Works of Aluminum Co. of America. It is the first of the giant presses ordered under the U. S. Air Force heavy press program to begin production. It can produce extrusions weighing as much as 2500 lb and measuring as long as 110 ft per piece.

World's Largest Extrusion Press

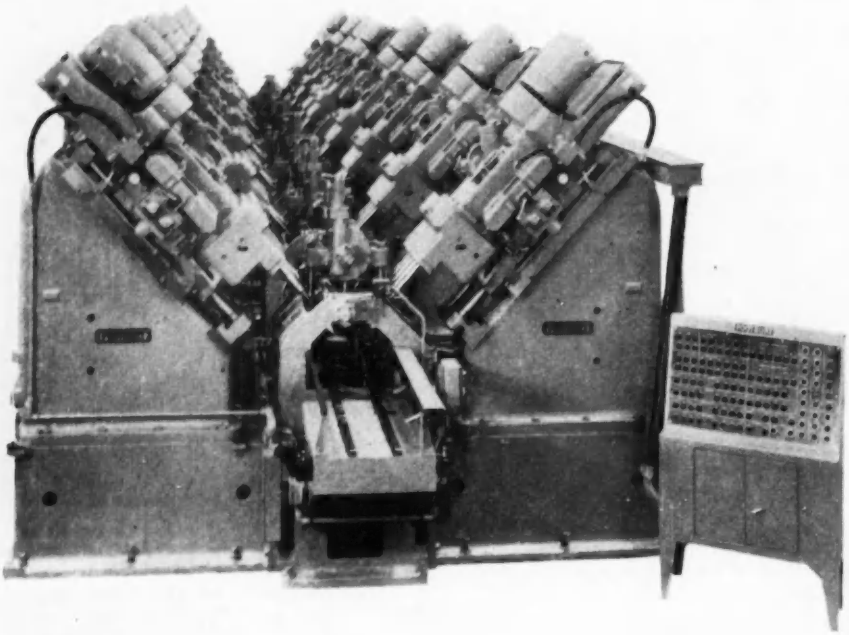
Extrusion cylinders (right) are the metal container assemblies for the press. The big assemblies, which weigh as much as 57 tons each, are used to hold the extrusion ingot. The press ram then pushes through the assembly and extrudes the metal through the die at the other end. A different assembly is required for each different diameter of extrusion ingot.



Auxiliary equipment for the 14,000 ton press is as impressive as the press itself. This 180-ft long stretcher will straighten extrusions up to 110 ft in length. As the world's largest machine for stretching extrusions, the unit has four times the force of any of its predecessors. It can straighten 75S aluminum alloy shapes up to 60 sq in. in cross sectional area.

Automatic Inspection

By Thomas Mac New



This special 17-station Footburt drills, reams, countersinks, and counterbores various holes in both cylinder banks.

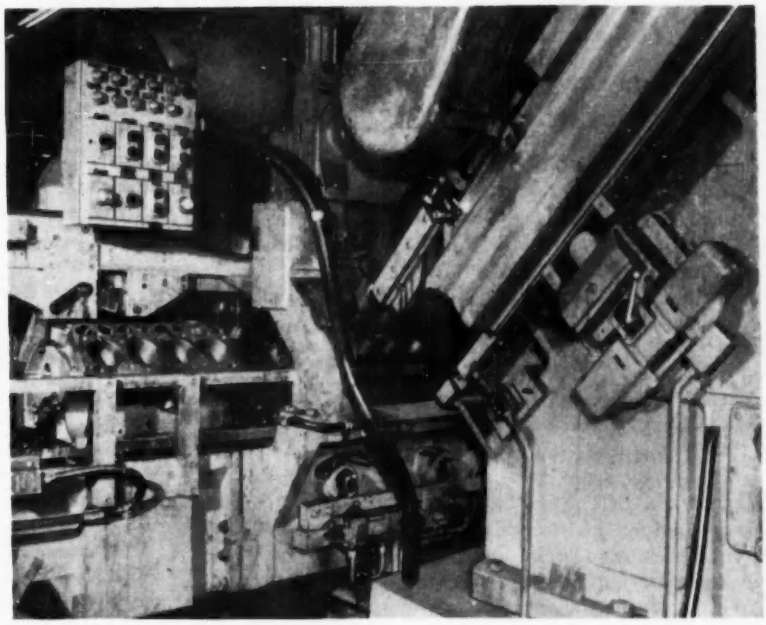
This special Cincinnati broach finish machines the pan rail and bearing locks of the block, and semi-finishes the banks and half rounds. The broach is of the horizontal two-way type with a ram speed of 200 fpm.

IN an article devoted to the production of the new 161 hp OHV V-8 Mercury passenger car engine at the Ford Cleveland Engine Plant, AUTOMOTIVE INDUSTRIES, April 1, operations on the cylinder head were discussed. Machining operations and the types of tooling utilized were described as well as the automation, cleaning, and inspection devices which make up the well-planned Mercury head line. This article deals with the manufacture of the cylinder block.

Starting off the block line, a Cincinnati one-way horizontal broach machines the top and side locating spots of the block for supplementary machining operations.

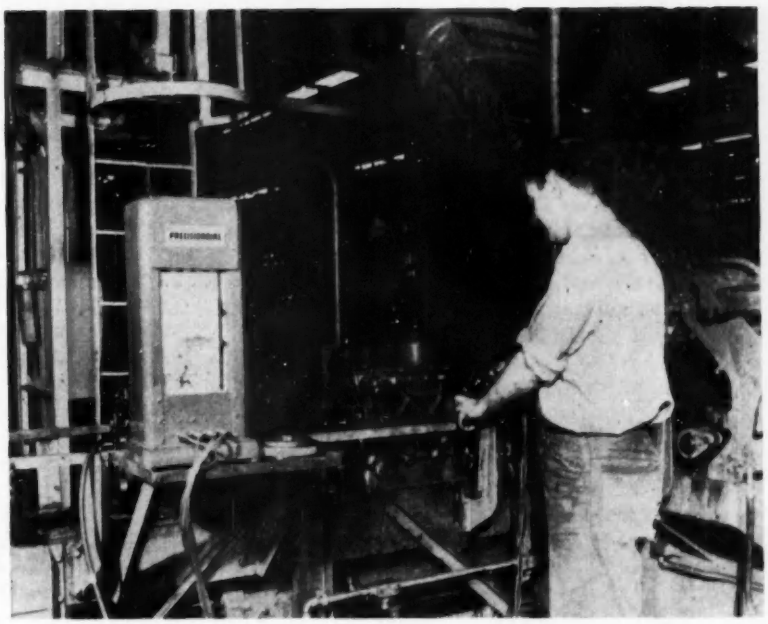
For the first major material removal operation, a very interesting Cincinnati Milling Machine Co. broach, of the horizontal two-way type, is employed. It has an electro-mechanical drive of 300 hp, and power is taken through a worm and worm wheel to a rack and pinion to develop a ram speed of 200 fpm. The two-way broach finish machines the pan rail and bearing locks of the blocks, and semi-finishes the banks and half rounds. From 0.015 to 0.020 in. is left on the banks for finish broaching. After machining in the first station, an automatic transfer mechanism moves the block to a roll-over fixture which turns it from

Ex-Cell-O machine which bores the cylinders.



Incorporated in CYLINDER BLOCK AUTOMATION

Sheffield air gaging equipment is used to check all cylinder bores. Finish bores are graded in eight sizes and stamped accordingly. The honing machine that performs the last machining operation on the block is shown in the background.



end to end 180 deg. The workpiece is then automatically located and clamped for the broaching operations at the second station of the machine.

In the accompanying illustration of the broach, blocks can be seen coming up the conveyor line for automatic loading into the first station of the broach, while the turnover fixture is about to deposit a block at the second broaching station. Inserted carbide tooling is used for both the roughing and finishing stages. Tooling bits can be removed and replaced without manual height adjustment. Devices such as clamping, transfer, and roll-over mechanisms are hydraulically powered and electrically controlled.

After broaching, the machine operations are performed on two lines of transfer machines integrated by various materials handling devices. On a special 19-station Cross Transfer-matic, there are numerous metal removal operations on the block such as drilling, reaming, and counterboring. The block is located by the oil pan face, main bearing side locks, and two cylinder bores. After two locating holes are reamed at the machine's fourth station, they are utilized instead of the cylinder bores for the remaining machine operations.

This Cross machine is used to drill, spotface, and counterbore the dis-

tributor shaft hole and locking bolt hole. Oil pan and main bearing holes are drilled and countersunk as well as a hole for a throttle mounting bracket. Oil pump pad holes are drilled, countersunk, and reamed, and an angular oil hole is drilled into the block. Four main bearing oil holes are drilled and the dip stick hole is reamed. One of the features of this Cross machine is the automatic checking, at station 5, of the locating holes. If the holes are not to prescribed tolerances, the block is automatically ejected. Holes must be not less than 0.7495 nor more than 0.7505.

For boring and chamfering the cylinders, an 11-station Ingersoll is used. Twelve-bladed boring bars are utilized to rough bore the cylinders to 3.561 to 3.567. When the eight cylinders are machined, the top and bottom of each is then chamfered. At the tenth station of the machine an air gage checks the relation of the cylinder bores to the locating holes in the block.

With the block transferring broadside, it undergoes milling operations in a traveling head, four-station Sundstrand mill. The front end of the workpiece is rough and finished milled and the rear portion of the work is rough and semi-finished milled. Cutters 14 in. in diameter and holding 62 carbide tipped tools are used for front and rear roughing operations. A 38 tooth cutter, carbide equipped, of the same diameter is used for the finish milling operation while a 50 tooth carbide tooled cutter is used for semi-finishing.

Again moving the block broadside by power conveyances, it is inserted in a 20-station Natco Holeway transfer type drilling machine. During the several operations on this machine, a multitude of holes are drilled and countersunk in the front and rear of the workpiece. Throughout the machining process, the work is continually checked; and just before a final machine inspection for depth of holes and their location in respect to the manufacturing holes, all chips are removed by air pressure.

Automation equipment then moves the block to a four-station air test machine which checks the oil gallery and oil supply hole for leaks. As each block is inspected for leaks, it is automatically stamped before proceeding to the next operation.

A high-production Sundstrand rise-and-fall milling machine, special five station type, works on the main bearing surfaces. Using a 2.750 in. diam., 0.163 to 0.164 in. wide, high-speed-steel milling cutter having 26 teeth, the five main bearings are notched to a depth of 0.160 to 0.165. In two successive operations, the machine straddle mills the sides of the main bearings.

Moving to another Natco Holeway machine, equipped with 19 stations, the block undergoes several machining operations such as drilling, chamfering, reaming, countersinking, and spotfacing. Work done on the block in this machine consists of drilling oil holes for the main bearings; drilling an oil filter supply hole; drilling and reaming Welch plug holes; drilling, countersinking, and spotfacing various mounting holes; drilling water drain holes; drilling and reaming a locating hole for the oil filter; and milling a pad for the oil breather tube. Before leaving the machine, the block is automatically turned over to dump chips.

Next, a special Foote-Burt 18-station transfer type machine tool performs further operations on the workpiece. At this point, several holes are drilled, reamed, countersunk, and counterbored in the top of the two banks of cylinders. Specifically, one oil supply hole is drilled in each bank; the oil dip stick hole is drilled and reamed; the oil breather tube hole is drilled; and mounting bracket holes, horizontal water drain hole, breather mounting pad holes, and the engine oil pressure unit hole are drilled and countersunk. Throughout the machining procedures, the block is continually gaged for accuracy in manufacture.

Another Foote-Burt is employed for the succeeding phase of production where the tappet holes are drilled, chamfered, and reamed to size. Two stations of the machine have been designed to remove chips from the workpiece by utilizing a turnover fixture. When the material removal operations are completed, air gages are used to check the location of tappet holes in respect to the manufacturing holes and to check the finish reamed diameter of the tappet holes which should be 0.500 to 0.501 in.

Automation then carries the block to a three station Ex-Cell-O where the eight cylinders are semi-finish bored to a diameter of 3.605 to 3.607 in. An air gage included in the machine tool is used to check the machining operation. Two blocks are loaded into the machine simultaneously.

An 11-station Greenlee transfer type tapping machine is next brought into use for the tapping of all holes in the block. Operations include tapping all head bolt holes, oil pan holes, dust pan cover holes, oil seal retainer holes, valve chamber cover holes, throttle mounting bracket holes, automatic transmission linkage hole, main bearing bolt holes, oil pump pad bolt holes, distributor locking bolt hole, engine mounting holes, water drain hole, oil filter bolt hole, oil lead holes, distributor wire bracket hole, engine assembly bracket holes, and oil gallery breather hole. Upon leaving the machine, the block undergoes a partial inspection. Any broken taps are removed with an Elox tap disintegrator.

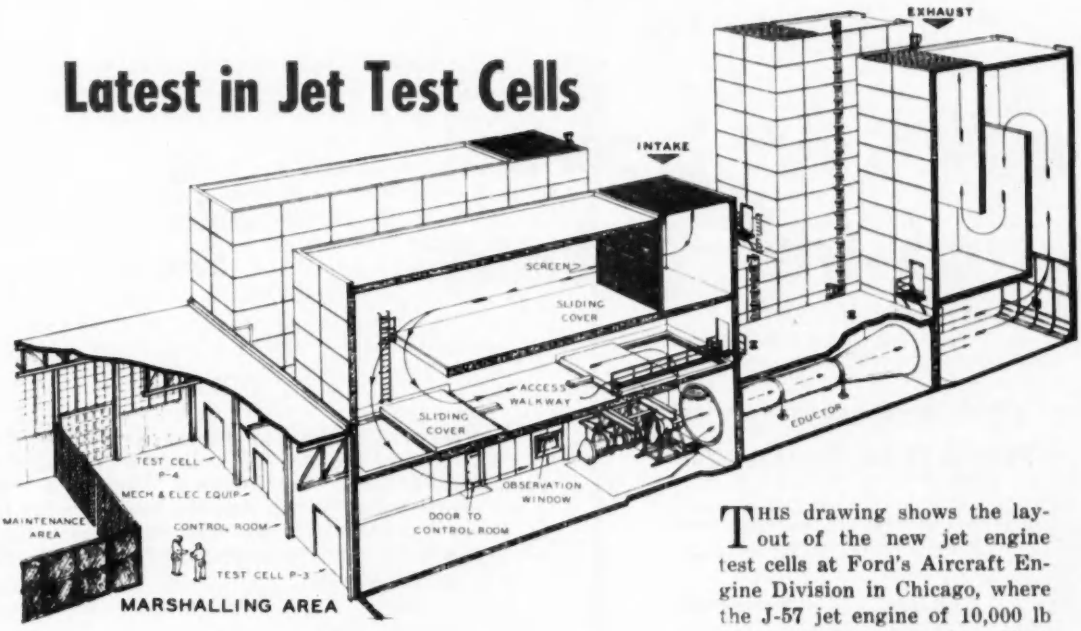
After being washed in a Solventol washer, the blocks go to the first manual operation—assembling the five main bearing caps to the cylinder block. Air operated torque wrenches on overhead rails are used to position the 10 bolts in place. An Expert three-station, transfer type, stud driving machine is used to automatically run the bolts down to the desired torque.

Camshaft holes are finished in an Ingersoll 19-station, cam and crank hole transfer machine. This machine also roughs and semi-finishes the crankshaft bores, turns oil slinger grooves, and faces and chamfers the thrust bearing. Before the actual machining of the work, the machine inspects the block for proper cutter clearance. Cam bores are finished to 2.0585-2.0575 in. while the crankshaft bore is semi-finished to 2.673-2.677 in. Sheffield air gages are used to check the cam and crank bore alignment.

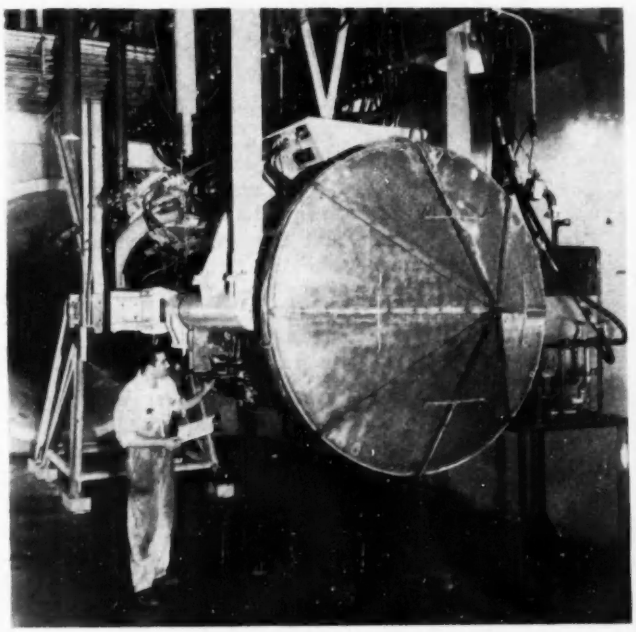
Five camshaft bearings are pressed into place by a special three-station Oilgear transfer machine which is

(*Turn to page* 128, *please*)

Latest in Jet Test Cells

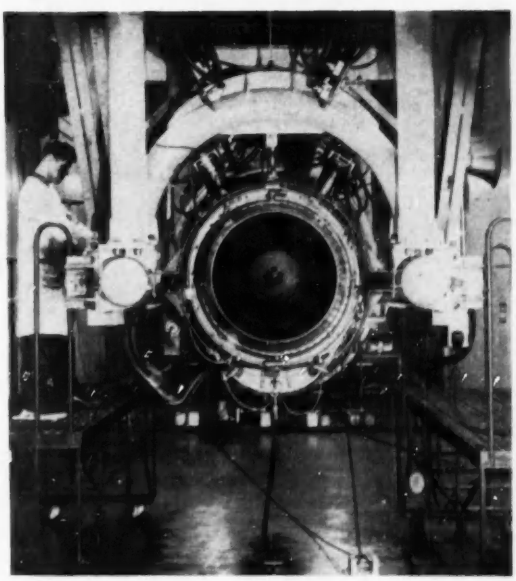


THIS drawing shows the layout of the new jet engine test cells at Ford's Aircraft Engine Division in Chicago, where the J-57 jet engine of 10,000 lb thrust is in production. Each test cell is designed to handle jet engines more than twice that power and the cells are said to be the quietest and most efficient in the world. A jet engine on the test stand draws 350,000 cpm of air through the intake, some passing through the engine and some by-passing it to flow directly into the eductor tube to cool the exhaust gases.



A J-57 on the test stand about ready for testing. The eductor tube can be seen at the rear. It is made of half-inch boiler plate steel and is 67 ft long, six ft in diameter at the center and increasing to 12 ft at each end.

Rear view of a J-57 on the test stand



Suppliers Are Important To Truck-Trailer Industry

By Andrew W. Shearer

IN Part I of this Two-Part Article which Appeared in the May 15 issue of AUTOMOTIVE INDUSTRIES, the Author Discussed the Growth and Potential of the Truck-Trailer Industry. Part II is Devoted to Industry Suppliers, Present Problems, and Future Outlook.

SOME appreciation of the importance of the truck-trailer market to its principal suppliers on an aggregate basis can be gained by considering its overall requirements for just a few typical parts during 1953. According to final figures from the Bureau of the Census, total truck-trailer production was close to 100,000 units last year.

On the assumption that each trailer was equipped with an average of 3.4 springs, 1.7 axles, seven tires, seven wheels, seven rims, one support, one fifth wheel, one brake system, and one wiring harness, simple multiplication will show the large demand for these components alone. When these figures are added to those for numerous other types of parts which constitute a modern truck-trailer, they add up to a huge total of units worth millions of dollars.

The needs of the vast truck-trailer industry for materials, components, and parts are fulfilled by such a multitude of suppliers that only those who are associate members of TTMA can be readily identified (see accompanying table). Broadly speaking, any local paint, lumber, hardware dealer, or large machine shop could be called a supplier to the industry, but these enterprises do such a widely diversified business that the truck-trailer industry could hardly be considered a major customer.

It appeared to the author that the composite picture of truck-trailer industry requirements from suppliers could be made even more meaningful by seeing just what volume of business the fulfillment of these demands meant to individual TTMA supplier members. Each of the 67 companies involved was canvassed on three points: (1) What products they supply to the truck-trailer industry; (2) the quantities of these products both in numbers and gross weights (if possible) supplied to the industry in 1952, the latest year for which such figures are available; and (3) the

SUPPLIERS SERVING THE TRUCK-TRAILER INDUSTRY

(Associate Members of the Truck-Trailer Manufacturers Association)

Company	Major Products
Aluminum Co. of America	Aluminum flat sheet, extruded shapes, rolled structural shapes, and wheel forgings
American Brake Shoe Co.	Friction materials
Austin Trailer Equipment Co.	Landing gears, fifth wheels, and pintle hooks
Bendix-Westinghouse Automotive Air Brake Co.	Air brakes
Berg Mfg. & Sales Co.	Connectors and electric brakes
Binkley Mfg. Co.	Cross sills, rub rails, body, door, and corner posts, lintels, headers, roofs and roof parts, slats, floor and skid strips, bumpers, fenders, landing gears, ventilators, doors and frames, fasteners, rolled shapes, and tire carriers
Bower Roller Bearing Co.	Roller bearings
Budd Co.	Trailer bodies, wheels, hubs, drums and small parts
Burton Auto Spring Corp.	Springs
Cargo Guard Co.	Heaters
Cooper Tire & Rubber Co.	Tires, tubes, and rubber parts
Dayton Rubber Co.	Tires, tubes, power transmission V-belts, radiator hose, and heater hose
Dayton Steel Foundry Co.	Wheels, brake drums, fifth wheels, and castings
Erie Malleable Iron Co., Automotive Wheel Div.	Wheels, brake drums, and component parts

approximate dollar value represented by these sales.

The results of the survey were most interesting from a marketing viewpoint and serve to emphasize the immense appetite of the industry for all types of materials, components, and parts. Unfortunately, the figures reported by those suppliers able to do so cannot be presented in detail or linked directly with their individual sources in any way for obvious competitive reasons. However, it is possible to compile and present data received from two or more firms supplying similar items without violating any confidences. The few illustrations which follow should suffice to spotlight the sizable volume of business done by truck-trailer suppliers.

For example, one group of companies sold to the industry 12,514,000 lb of springs worth $16,907,000 in 1952, while another group supplied about 23,519,000 lb of axles worth approximately $7.5 million. All told, nearly 400,000 tires worth close to $32 million with a gross weight of 61 million lb were furnished by several companies in this field, while just three suppliers of brakes sold approximately 5.7 million lb of them worth in the neighborhood of $10 million to the industry. Similarly impressive figures could be compiled to show that truck-trailers represent "big business" to suppliers of other products as well.

Substantiation may be given to the above figures by looking at a partial 1952 material consumption statement received from a large trailer manufacturer. He purchased from suppliers for his 1952 commercial trailer production the following: 8155 axles; 15,074 wheels; 4530 supports; 30,720 rims; 4778 brakes; 30,720 tires; 12,750 tons of steel; 1370 tons of aluminum; and a total of 97,000 standard and special option lights. These quantities pertain to just one manufacturer, so those for the entire industry run into huge figures.

It must be remembered also that Government restrictions on materials were in effect in 1952. The

TRUCK-TRAILER SUPPLIERS
(Continued)

Firestone Steel Products Co.
Wheel rims, spacer bands, wheel attaching parts, and miscellaneous accessories

Flexi-Fend Corporation
Mud guards

General Tire & Rubber Co.
Casings, tubes, air springs, and mechanical rubber goods

Goodrich, B. F., Co.
Tires and various rubber products

Goodyear Tire & Rubber Co., Inc.
Tires, tubes, flaps, rims, and various rubber parts

Great Lakes Steel Corp., Stran-Steel Div.
Flooring

Grote Mfg. Co., Inc.
Lamps, flares, and reflectors

Gunite Foundries Corp.
Wheels and brake drums

Gustin-Bacon Mfg. Co.
Insulations

Hart Metal Products Corp.
Structural parts and panels

Harvey Machine Co., Inc.
Aluminum extrusion components

Hendrickson Motor Truck Co.
Tandem suspensions

Holland Hitch Co.
Fifth wheels, landing gears, king pins, platie hooks, couplets, lunettes, tow eyes, and draw bars

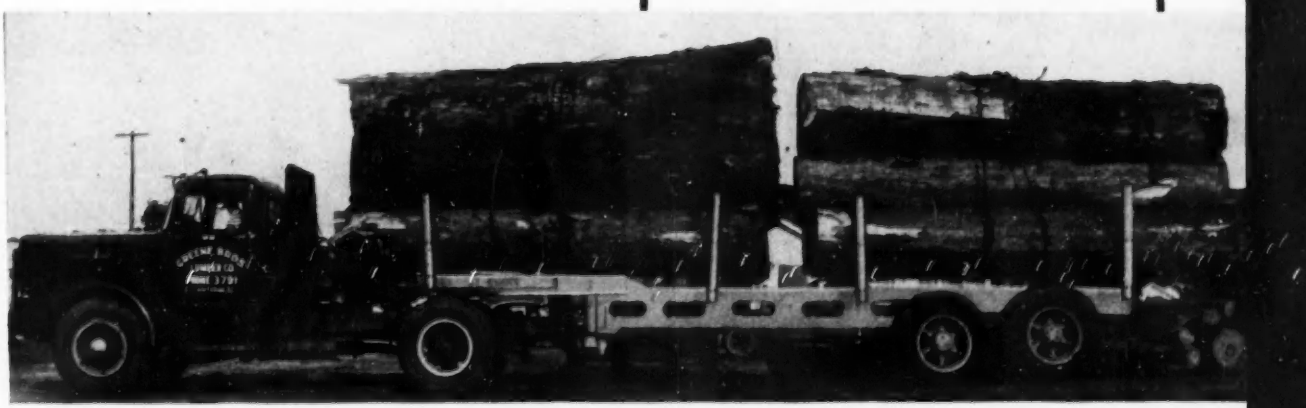
Homan & Co., Inc.
Landing gears, wheels, and brake drums

Hunter Mfg. Co.
Heaters and coolers

Hutchens & Son Metal Products, Inc.
Axle suspensions and component parts

Kelsey-Hayes Wheel Co.
Power brake equipment

Kochton Plywood & Veneer Co., Inc.
Plywood panels and insulations



The Evans logging trailer has a height of 54 in. and an overall length of 28 ft, six in. All-welded steel frame is 42 in. wide, and bolsters are 96 in. long of six in. by six in. steel plate ½ in. thick. Trip standards are made of heavy-duty, 4½-in. diam pipe, 48-in. long, with safety release slide lock, ⅝ in. adjustable chain. Weight of the entire unit is 11,500 lb.

TRUCK-TRAILER SUPPLIERS
(Continued)

Laher Spring & Tire Corp.
Springs, brake blocks, and brake linings

Mansfield Tire & Rubber Co.
Tires and tubes

Mechanex Corp.
Wheel oilseals

Midland Steel Products Co.
Air and vacuum power brake equipment

Moog Industries, Inc.
Leaf springs and component parts

Nash Bros. Co.
Tire carriers, bumper guards, and body parts

Ness Co.
Rims, springs, wheels, drums, landing gears, and tandem assemblies

Neway Equipment Co.
Axle suspensions

Ohio Moulding Co.
Structural shapes, decorative mouldings, drip mouldings

Orscheln Brake Lever Co.
Brake levers

Palmer Equipment Co.
Axles

Parish Pressed Steel Co.
Rails, sills, outriggers, understructures, body stampings, and component parts

Pennsylvania Rubber Co.
Tires and tubes

Preco, Inc.
Cargo heaters

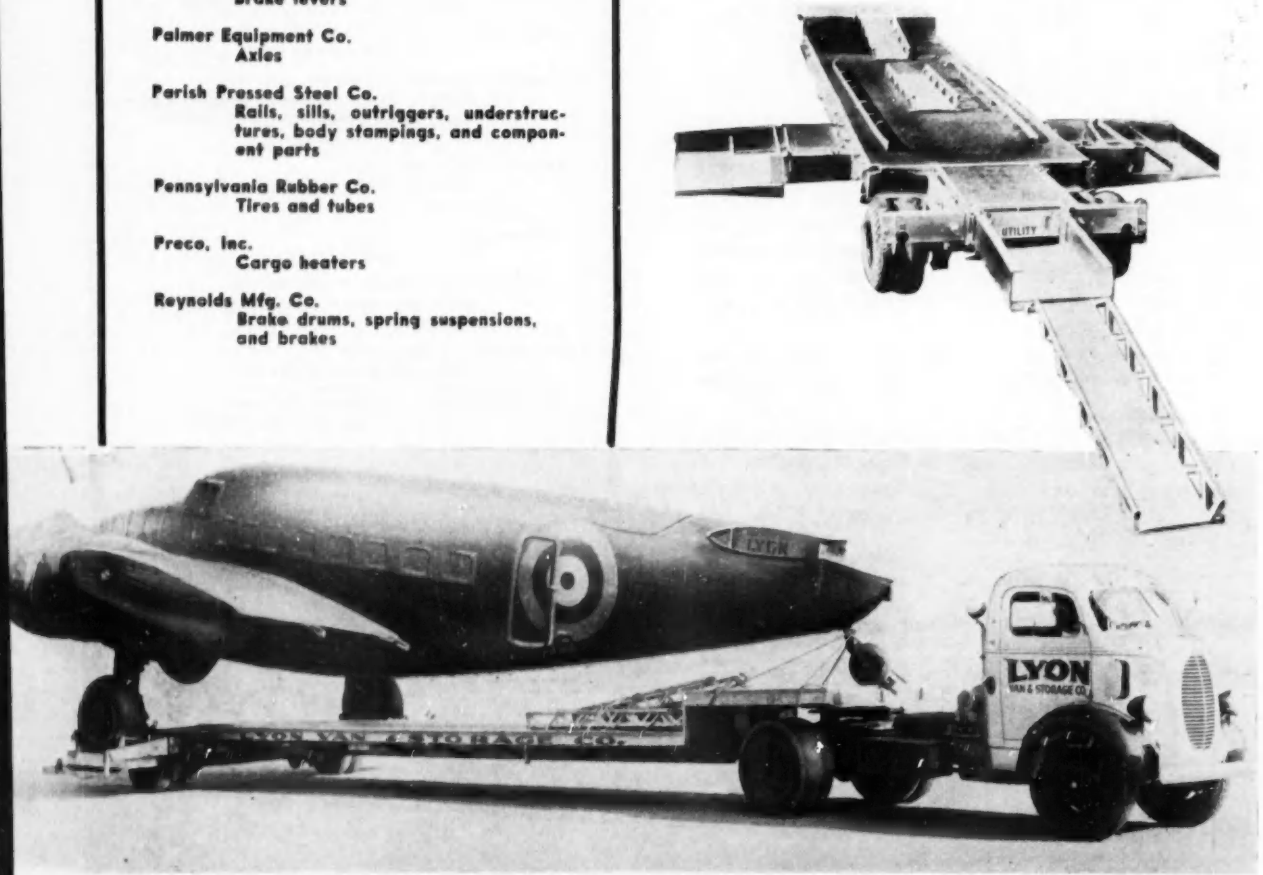
Reynolds Mfg. Co.
Brake drums, spring suspensions, and brakes

number of trailers produced was of necessity curtailed, thereby reducing the industry's demand for materials, components, and parts far below that for last year, this year, and the years to come with restrictions now off. For example, one aluminum industry spokesman has predicted that in the foreseeable future the truck-trailer industry will be consuming between a total of 50 and 60 million lb of aluminum annually.

Industry Problems and Outlook

The truck-trailer industry, although it has consistently displayed a vibrant and progressive spirit during its rapid rise to an important place on the automotive scene, has not escaped growing pains in the process. Nor, as it enters the threshold of maturity, has it been able to overlook pressing problems that seem destined to remain with it for some time.

Frequently and unjustly criticized as a troublesome "behemoth of the highway," the truck-trailer has often been made a "whipping boy" by both Federal and state legislative bodies. For example, although only 17 per cent of all motor vehicles using the nation's highways are trucks, they pay more than 30 per cent



This unique low-bed aircraft carrier, built by Utility Trailer Manufacturing Co., was required to be entirely legal when empty; that is, within the 35-ft overall length and eight-ft overall width restrictions. When the airplane was loaded, however, stability was of prime importance. The plane wheels were supported on hinged outriggers at approximately 22-ft overall width, and the axle was lengthened to give the needed balance.

of all special highway-use taxes, such as gasoline and license fees. Nonetheless, the industry is constantly being accused of not paying its fair share of highway taxes.

The truck-trailer industry is as anxious as any group to see much needed improvements in our sadly neglected highway system, and it is willing to pay its fair share of the costs for them. It stands solidly behind such projects as PAR, and although it is generally in favor of free roads, is a willing backer of turnpikes where they appear to be the only immediate solutions to traffic problems.

Even though at times the industry's public relations have not appeared to be all that they could or should be, it is making a commendable effort to present its side of the story on matters which vitally affect it. By way of further reply to the critics who accuse it of not paying its fair share of taxes, the industry points out that no form of commercial transportation equipment competing with truck-trailers for a share of the commodity movement business is subject to the eight per cent Federal manufacturers excise tax.

Second, in answer to the cry in some quarters for more and more regulation of truck-trailers, the industry cites the utterly confused hodgepodge of state legislation on vehicle size and weight limitations which make inter-state operations complex beyond description as it is. For example, in Michigan the total gross load may exceed 100,000 lb, while in Kentucky it cannot weigh more than 42,000 lb. Similar contradictions exist in the 48 states in such matters as highway-use taxes, and registration and special carrier fees.

The industry admits that some degree of regulation is probably necessary and desirable, but advocates with reason that it should be applied on an equitable and consistent basis. Furthermore, the industry contends that such regulation should consist only of rules applicable to safe operation of vehicles on the highway and size-and-weight restrictions designed to protect

TRUCK-TRAILER SUPPLIERS
(Concluded)

Reynolds Metals Co.
Sheets, plate, extruded shapes, panels, side sections, sills, corner posts, rails, and components for underframe, nose, roof, and rear sections

Rockwell Spring & Axle Co., Timken-Detroit Axle Div.
Axles

Sears, Roebuck & Co.
Tires

Seiberling Rubber Co.
Tires and tubes

Shuler Axle Co.
Axle and component parts

Signal-Stat Corp.
Directional signals

Six Robblees', Inc
Wheels, axles, rims, brake drums, linings and controls, hitches, fifth wheels, tandem suspensions, connectors, tools, jacks, hoists, and cranes

Standard Forge & Axle Co.
Axles, spring suspensions, and forgings

Sterling Bolt Co.
Bolts, nuts, screws, rivets, and washers

Union Asbestos & Rubber Co., Coldmobile Div.
Refrigeration units

Union Metal Mfg. Co.
Undercarriages

United States Rubber Co.
Tires and tubes

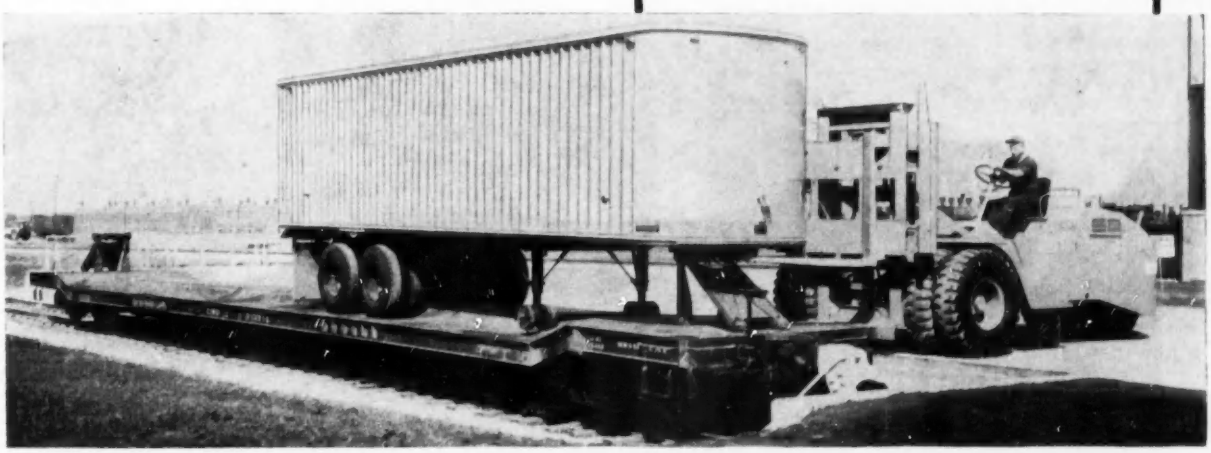
U. S. Thermo Control Co.
Refrigeration units and repair parts

Warner Electric Brake & Clutch Co.
Electric brakes and accessories

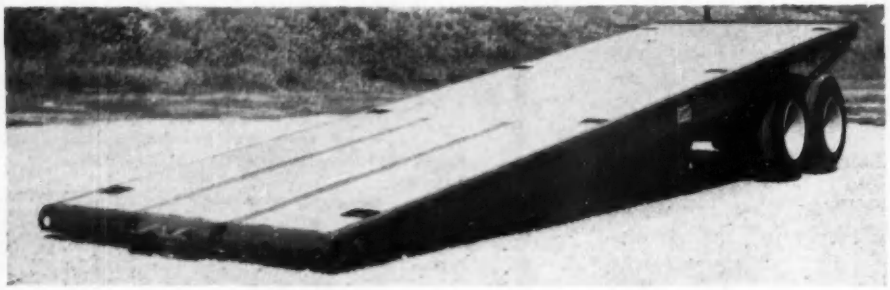
Webb Corp.
Wheel assemblies

Windmiller, Harry J., & Co.
Body parts, universal joints, brake equipment, power take-offs, couplers, axles, electrical equipment, suspension systems, and component parts

Youngstown Steel Car Corp.
Frame rails, outriggers, bolsters, and component parts



The "piggy-back" method of trailer transportation by rail is shown in operation here as a "Trailoader" modified hydraulic lift truck, made by Ross Carrier Corp., sets kingpin of trailer in stanchion of well-type trailer car. Especially designed for the purpose by Electro-Motive Div. of General Motors Corp., the car is 75 ft in length and is equipped with roller-bearing, high-speed freight trucks.



Shown here in loading position is the Hobbs self-loading float flat-bed trailer. Designed particularly for oil field operations, it comes in standard lengths of 26, 28, and 30 ft. A truck with winch and cable draws load into position from rear then moves to the front, and by using winch again, raises front of float onto fifth wheel. Many loads are tailboarded onto the float also.

pavements and bridges from premature failure.

Third, the industry has often been castigated as a destroyer of present-day roads and painted as a potential threat to the longevity of any new roads that may be built. In addition to the series of road tests conducted to show that even extremely heavily loaded trucks do not damage a properly constructed pavement, sound refutation for the foregoing argument can again be found in the fact that trucks represent such a relatively small percentage of the total traffic volume using the nation's highways; therefore, they could hardly be held responsible for the major wear and tear on them. Many students of the highway problem have identified weather as a primary culprit.

From a competitive point of view, the truck-trailer industry has little cause for worry, since trucks today carry two-thirds of all the tonnage moved in the nation's commerce. The industry's arch rival always has been the railroads. Although there has understandably been and probably will continue to be some "bad blood" between the two, it is interesting to note a greater realization of the bonds of inter-dependence between the two growing.

In this connection, the recently introduced plan for the hauling of truck-trailers on railroad flat cars has gained a surprising number of adherents on both sides. This "piggy-back" scheme has given rise to talk of a real "marriage" between the two opposing factions, but if such a union comes about, it will not be a "shotgun" affair. Both parties are watching the development with interested caution, but neither is rushing into it blindly.

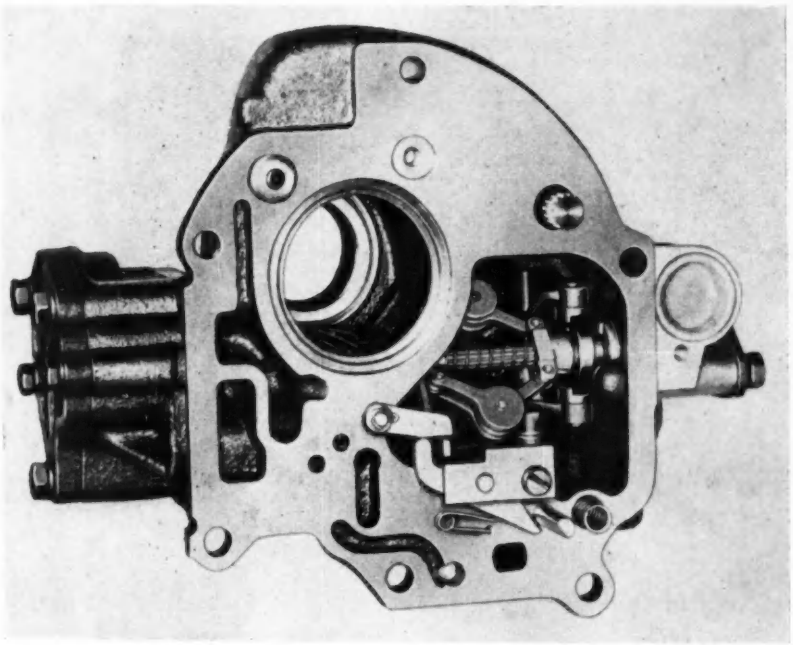
Sponsors of the idea state that it would enable the railroads to win back some of the traffic they have lost to the truckers in recent years. On the other hand, they say, road carriers would benefit from speedier freight deliveries and possibly lower costs. Critics of the scheme say that it is not economically feasible, that the truckers alone would profit, that freight deliveries might be slowed down rather than speeded up, and that investments by the railroads in trailer trains would be lost if a sizable volume of traffic could not be maintained. Although the plan has been tried with success here and there, there are many problems to be ironed out before it will ever, if at all, come into general, wide-scale use.

While the truck-trailer industry will continue to face problems at every turn of the road, its role as a major factor in the country's economic development seems assured of continuation. It is estimated that by 1975 the industry may be producing as many as 175,000 truck-trailers anually with a value of $920 million dollars. If this prediction proves correct, and there is good reason to believe that it will, the "golden age" of the industry is just beginning for truck-trailer manufacturers and their suppliers alike.

Easton Model TD-1832H side-dump trailer, built for service with the Caterpillar Model DW-20 tractor, is designed for contracting, quarrying, and mining service and has a rated capacity of 32 tons. Dumping is powered by two outboard - mounted hydraulic jacks controlled from the operator's seat. Although dumping is to one side only, interchangeable mounting of the body and jacks permits reversal of direction.

Studebaker Champion Automatic Transmission

New Unit Provides Three Automatic Ratios in Drive Range

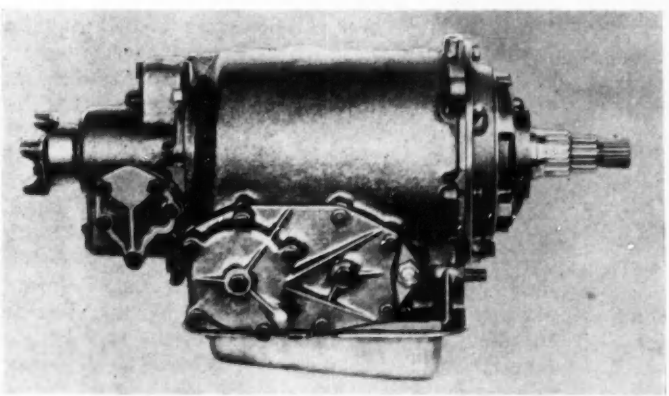


Automatic transmission used in the Studebaker Champion

STUDEBAKER automatic transmissions used on Champion models for 1954 provide for starting in low gear with the selector lever in the "D" position. This feature was mentioned in the announcement of Studebaker's passenger car line for 1954 (see AI, Dec. 1, 1953) but at that time full details were not disclosed.

Shift speeds, for the low start transmission, are as follows: As the car is started in "D" range the transmission will upshift from low to drive intermediate at eight to 10 mph under light throttle; 19 to 22 mph under full throttle; and 33 to 35 mph in the kick-down position. The upshift from drive intermediate to drive direct will occur at 17 to 20 mph under light throttle; 32 to 34 mph under full throttle and 62 to 65 mph in the kick - down position. The downshift from drive direct to drive intermediate, with a closed throttle, will occur at 15 to 17 mph and from drive intermediate to low at seven to nine mph.

No kick-down can be obtained when car speed is greater than 54 to 57 mph. Maximum part throttle (not kick-down) downshift from drive direct to drive intermediate can be obtained at car speeds of 30 mph or less. There is no part throttle downshift from drive intermediate to low. The only time this shift occurs is when the car speed is reduced to seven to nine mph with the throttle closed.



New external case

Several changes have been made in the Champion transmission-extension case to provide for low-gear start in the "D" position.

The inner stop on the governor-valve-stop plate has been eliminated; this permits the governor spring to move the governor valve into its cylinder shutting off the oil passage to the multiple disk clutch. Therefore, when the selector lever is moved to the "D" position, only the forward drive band is applied.

A gravity pawl, rocker arm, rocker arm spring and control plunger, similar to those used on early model Commanders (1950-51-52), are used in the new Champion extension housing. The

(*Turn to page* 114, *please*)

Plastic Bodies

Flat experimental plastic body on V-8 sports chassis.

TURIN, ITALY

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

AMONG the high spots of the International Motor Show held last month in Turin, Italy, were plastic bodies, an experimental gas turbine powered Fiat, Alfa Romeo light delivery vans with front wheel drive, an O.M. transmission with preselective electro-mechanical gearshift, and a Lancia truck chassis with a front-mounted, flat six Diesel.

Despite quota restrictions, Italy's 36th automobile show assumed an international character with 450 exhibitors occupying 270,000 sq ft and representing 11 nations. There were 66 makes of passenger cars, England heading the list with 19, followed by U.S.A. with 18, the others in order of numerical importance being Italy, France, Germany, Spain, Argentina and Sweden. The show covered every branch of the industry from scooters to heavy trucks.

Alfa Romeo presented an ambulance and a 10-passenger bus or light delivery van. For the first time in Alfa Romeo history these have front wheel drive. Two types of power plants are available; a Diesel and a gasoline engine. The Diesel is a two-cylinder two-stroke unit of 70 cu in. piston displacement. It is built under Austrian Jenbacher license, to the designs of Prof. List, and has two vertical cylinders. It is equipped with a Roots type belt-driven compressor, and develops 30 hp at 2800 rpm. The alternative engine is an Alfa Romeo type of 78.6 cu in. piston displacement, with two overhead camshafts, developing 35 hp at 3500 rpm. It is a stepped-down version of the one used on a new Alfa Romeo sports car. Transmissions are the same for the two types; the engine is ahead of the axle and the drive is taken through a single plate clutch and a four-speed gearbox. Double universal joints are used on the drive shafts.

Front suspension is by transverse spring to independent wheels, while rear springing is by torsion bars. Overall length is 169 in. and width 67 in. Weight is from 2860 lb to 3300 lb, according to type of body. Load capacity is 2200 lb.

Alfa Romeo's new passenger car is the Giulietta Sprint, a sports model with a four cylinder, two-overhead-camshaft engine of 79 cu in. piston displacement, developing 65 hp. Bore is 2.91 in.; stroke is 2.95 in. Unlike other models, cylinders are a light alloy casting with wet liners and the head also is light alloy with front-mounted chain drive for the camshaft.

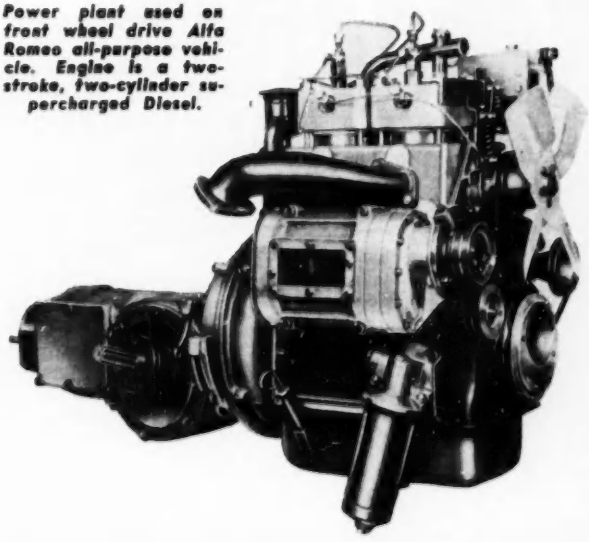
In general, chassis layout of the new Alfa Romeo is somewhat similar to the larger 1900 model, with independent front suspension. This latter is a modification of that on the 1900 model and comprises support arms with an inclined coil spring, the steering knuckle forging being connected to the ends of the support arms by ball and socket joints. The rigid rear axle is guided at each side by longitudinal radius arms and at the center by a triangular stabilizer con-

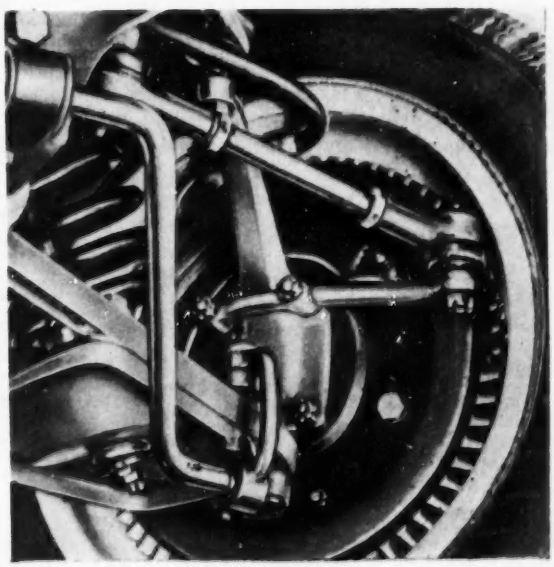
and Gas Turbine Car at Turin Show

Special Bertone body on Alfa Romeo chassis.

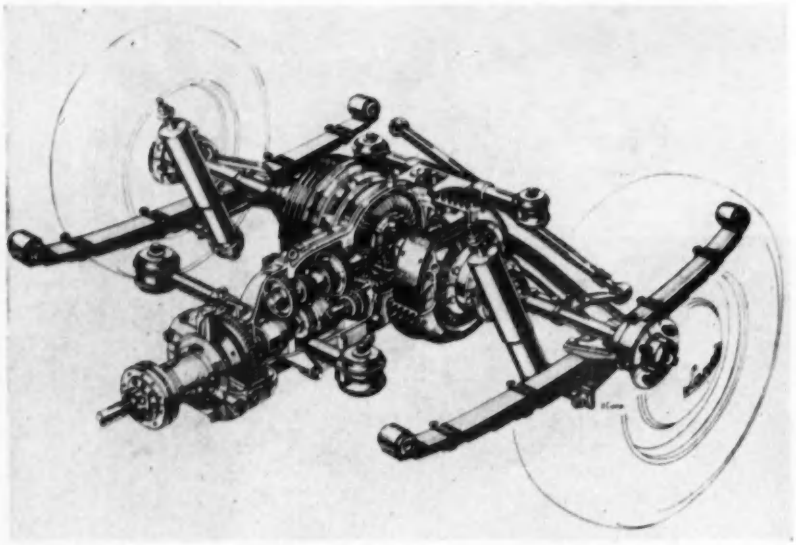
nected to the top of the differential housing and to the platform chassis. Rear suspension uses coil springs. The coupe body is a one-piece construction welded to the chassis frame and at present these are built by either Ghia or Bertone to Alfa Romeo designs. Weight of the Giulietta Sprint is about 1700 lb. *(Continued)*

Power plant used on front wheel drive Alfa Romeo all-purpose vehicle. Engine is a two-stroke, two-cylinder supercharged Diesel.





Front suspension of Alfa Romeo Super.



New Lancia rear axle and transmission assembly.

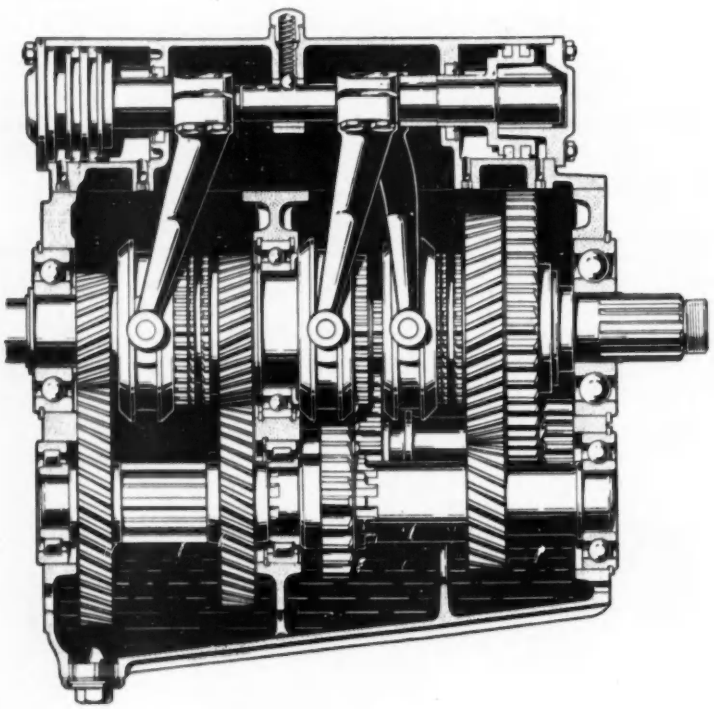
On a new edition of the 1900 model, piston displacement has been increased to 120 cu in., a downdraft Solex carburetor is used, and maximum output has been increased to 90 hp at 5200 rpm. With a view to greater silence, a new cam profile has been adopted, also new pistons. The oil pump has been moved from the front to the side of the engine and is driven at half crankshaft speed. Brake drums are light alloy with turbine fins.

Fiat is concentrating on three passenger car models, the 1100, the 1400 and the 1900, the latter two having become respectively the 1900 A and the 1400 A. In the 1400 A output has been increased by 10 per cent to give 50 hp, by a twin throat carburetor, new intake manifold and a higher compression head. On the 1900 A changes are a twin throat carburetor, new intake manifold, new camshaft, new cylinder head with high compression and a changed final drive ratio. Changes in styling include the rear fenders, larger rear window and improved upholstery. In the 1900 range there is a new sedan with increased visibility all around. Fiat's big production line is the 1100, which is now supplemented by a high-speed touring version. Engine output has been stepped up to 50 hp. This year's modifications do not involve any increase in price.

Fiat presented an all-plastic body on the V-8 sports chassis. Indications are that this is not likely to go into production in the immediate future. Produced entirely in the experimental department, this body is composed of an inner steel skeleton, which forms the stressed structure, and of an outside shell entirely of plastic material. The outer plastic covering consists of woven glass fiber impregnated with polyester resins. It has a thickness of about ⅛ in. and is built up of two layers of glass fiber with a layer of glass felt between them. The whole body, including seats, is in one piece. Weight is 107 lb.

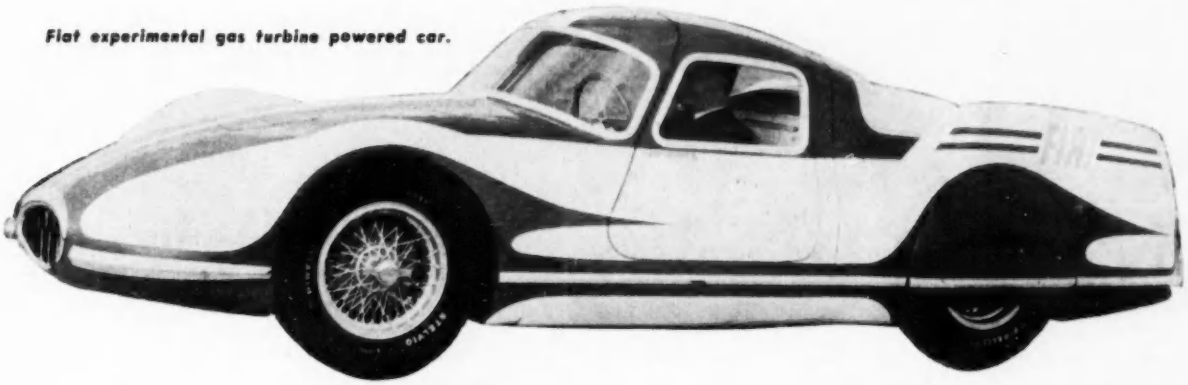
Cost of raw material in Italy appears to be the main reason for the comparatively small development of plastic construction. Further, the specialized body builders lack technical experience and at present are able to produce small output in metal cheaper than in plastic.

Lancia's main line of construction, featuring narrow angle V engines with four or six cylinders, has undergone no change, but three of the Aurelia series have



Preselective, electro-pneumatic O.M. transmission.

Fiat experimental gas turbine powered car.



been dropped to be replaced by the Aurelia Series II, with the piston displacement of the six cylinder engine increased from 121 to 138 cu in. There is a slight drop in the compression ratio, but output has been stepped up from 70 to 87 hp at 4300 rpm. An important change at the rear is the adoption of a De Dion type axle with semi-elliptic springs, in place of independent rear suspension. The four speed transmission forms a unit with the differential and has overdrive on fourth and, as formerly, brakes are inboard. On the Gran Turismo model, with a piston displacement of 152.5 cu in., rear end construction is similar to the Aurelia Series II.

The Argentine's contribution to the automobile industry was built to the designs of Italian engineers. Known as the Justicialista, there are two models, a sedan and a three passenger sports car, the latter in plastic construction. A feature of the sports model is that the top, including the windshield and the rear glass, is removable.

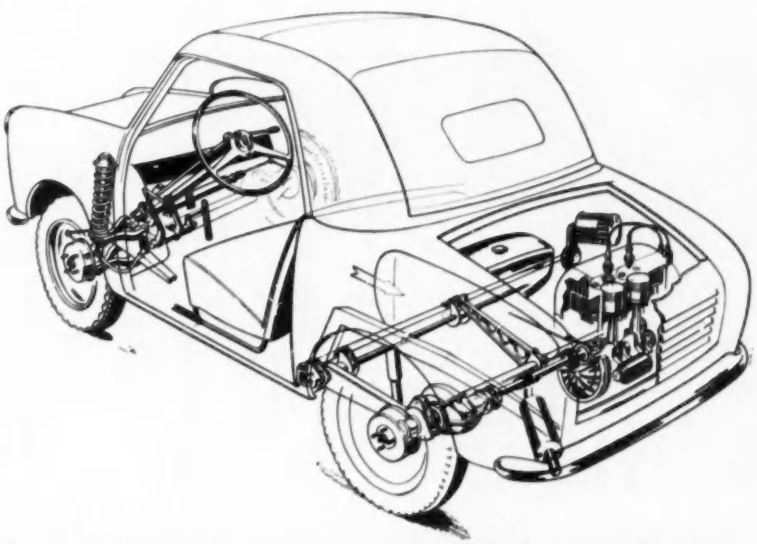
The sports model has a four cylinder, valve-in-head engine of 90.7 cu in. displacement, with four speed transmission and front wheel drive, while the sedan is equipped with a vertical two-cylinder, two-stroke water-cooled engine having a displacement of 48.8 cu in.

The Panther, powered by a 12-hp, two-cylinder, air-cooled Diesel of only 29.2 cu in. piston displacement, was on display although it is not yet in production. The cylinders are shrouded and cooling is provided by two fans, one drawing in cool air and the other evacuating hot air. A three-speed transmission forms a unit with the engine and drive is to the front wheels which are independently sprung by transversely mounted coil springs. Rear suspension is similar. The chassis frame is tubular and the two-passenger body is entirely in light alloy. Plans are under way to build the car in Milan.

More than any other country in Europe, Italy is interested in the small, economical automobile. The scooter has met with enormous success. The next stage is the closed scooter, as represented by Isella. This firm has gone a step further with the Isocarro, a light delivery vehicle with a 14.3 cu in., two-stroke engine mounted in a tubular chassis frame behind the driving cab and transmitting its power to the rear axle through a three-speed transmission and open shaft. This is designed to carry two persons and a 1000-lb load.

A cheap two passenger runabout of some interest was presented by Siata. The welded all-steel body has a unit engine, clutch, and four-speed transmission mounted transversely at the rear at three points with rubber blocks interposed. An open shaft with rubber couplings carries the power to an offset differential housing on the tubular rear axle, and final drive is by spur

(*Turn to page* 106, *please*)



This schematic illustration shows arrangement of units in the two-passenger Siata.

New Aids for Inspection Save Time,

NEW, compact photographic inspection aids are replacing blueprints at Northrop Aircraft, Inc., to effect a 50 per cent time reduction in inspection of Scorpion F-89D all-weather interceptor assemblies.

Key to the time saving is a visual check list used by the inspector to inspect a specific job of work that has been accomplished. All of the requirements that are necessary to be inspected are listed. In addition, a photograph or a sketch of the part of the assembly that is applicable is included and the specific locations of the items to be checked are indicated.

High quality is maintained under the new inspection program. The photographic aids are clearly indexed, the more complex assemblies are highlighted and previously discovered trouble spots are noted to guard against repetitive errors in the product.

Many documents that once had to be individually consulted during inspection are combined in a visual check list, one type of inspection aid. Among these are a composite of blueprint analysis, assembly parts list callouts, job summary and inspection sheets, photographs, process bulletins, finish specifications, Army-Navy standards, company engineering standards, station locations and actual experience reports.

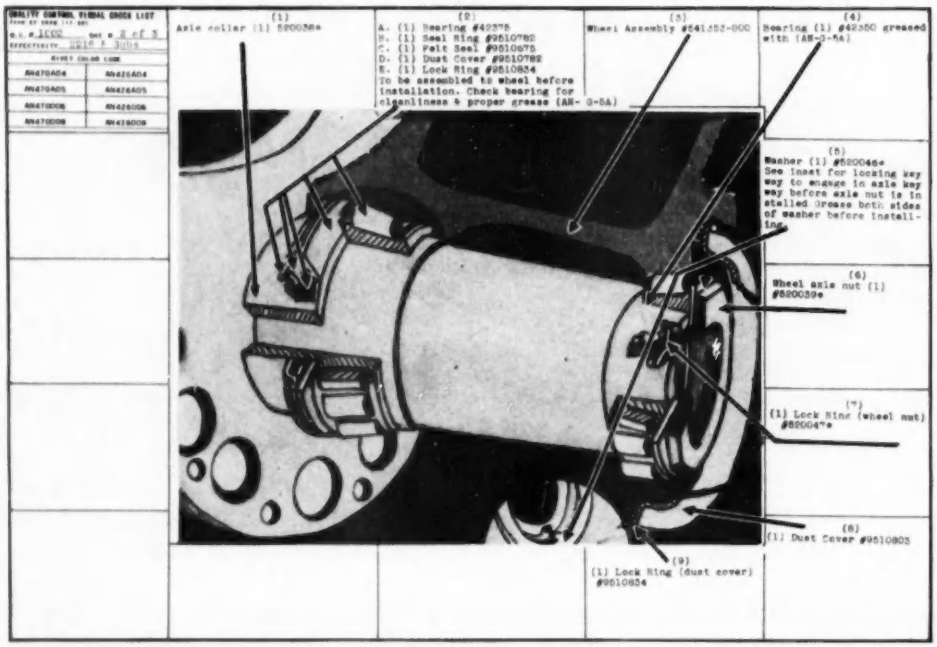
Graphically and specifically, Northrop's inspection aids tell where the task is; what the finished job should look like; what the assemblies should contain; location of critical points; and what should be inspected.

By Lany Moir, Supervisor
Quality Control Planning, Northrop Aircraft, Inc.

Visual check lists are checked daily to keep them up to date and to incorporate changes in the inspection process. Changes issued by the firm's engineering, planning, tooling or quality control groups can be easily made on the photographic inspection aids.

The physical composite of the visual check list is a laminated assembly of a sheet of cardboard approximately 1/16 in. thick and approximately 10 in. by 14 in., two pages of typewritten information reproduced by the Ozalid method approximately 10 in. by 14 in. and one single sheet matte paper print.

The method of lamination of these materials is by the dry mount process which, briefly, is a heated flat metal surface upon which the materials to be laminated are placed with a thin sheet of heat sensitive adhesive inter-leafed. A pressure plate or cover is applied to this assembly and the temperature increased until the adhesive forms a perfect bond between the laminates. This results in an overall form approximately 10 in. by 14 in., with information contained



At right is shown the front of a typical quality control visual check list.

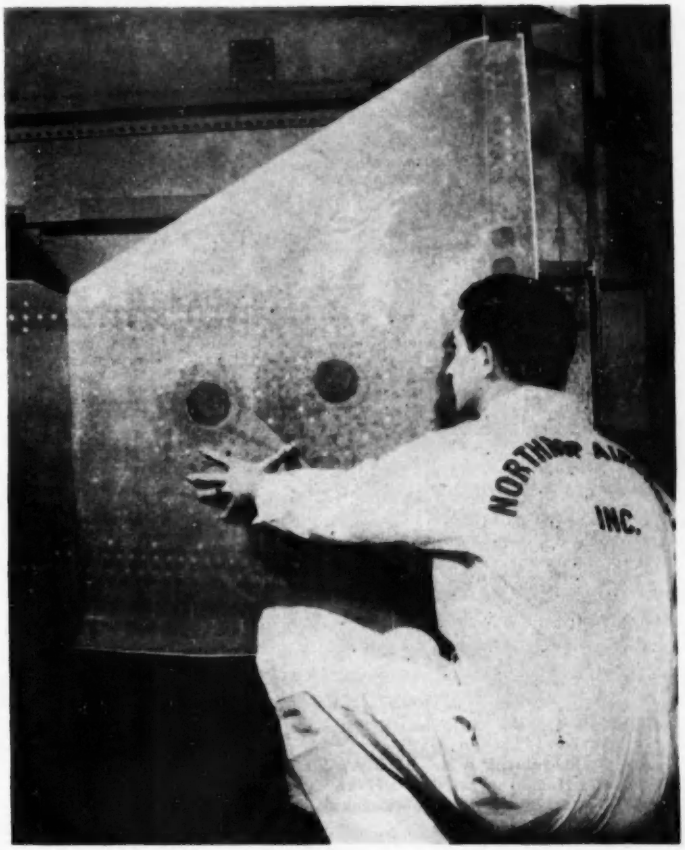
At far right (on the next page) is shown the back of such quality control visual check list. In addition to the information and general instructions depicted here, space is provided also for special inspection instructions.

Improve Quality

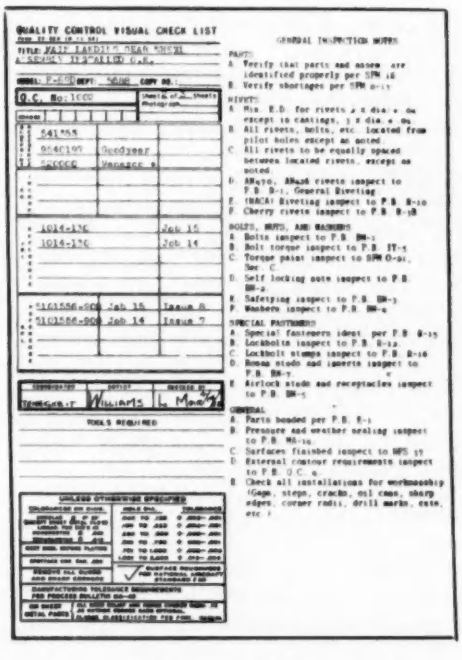
both on the front and on the back sides.

Upon removal from the dry mount machine, a coating of clear plastic spray is applied to increase the life expectancy of the form in shop use. The plastic spray retards stain, oil saturation, smudging, and fingerprints. It can be readily removed to permit local changes and then re-applied. The photographs used for these composites are decided upon by the coordinator who composes the material comprising the check list.

It is necessary that an amount of research and pre-planning be done on each job prior to the composition of the check list. Such pre-planning consists of reviewing the parts lists provided by the Production Planning Department, reviewing the blueprints that are applicable to the specific job, reviewing the actual assembly after it has been completed in the Assembly Department, discussing the problems of the assembly with both the production leadman and the inspection leadman in the area. The information then is placed on the visual check list forms in a rough draft. Upon completion of this, it is given to a typist who types the information on a vellum



Inspectors of aircraft surfaces use templates of Fiberglas to check the types of fasteners installed in an F-89D wing panel. The transparent overlay is laid on the surface to be inspected. Markings on the template indicate the proper fastener for each hole.


QUALITY CONTROL VISUAL CHECK LIST

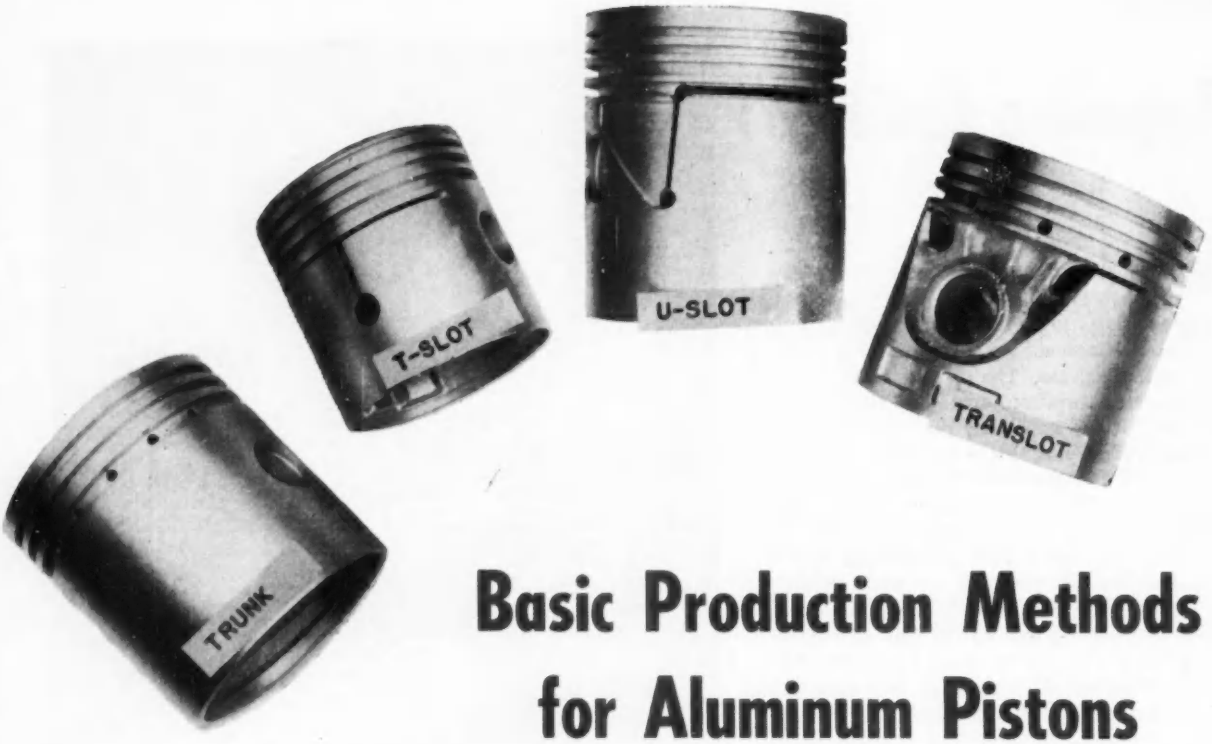
GENERAL INSPECTION NOTES

master so that additional copies may be reproduced. The vellum is then sent to the blueprint reproduction department which produces, by the Ozalid method, the required number of copies. These are returned to the department and the lamination process is conducted. After lamination, an illustrator applies the necessary additions in the way of arrows, letters, numbers, removal or addition of parts of the pictures. The assembly is then sprayed with the clear plastic and delivered to the shop to be filed in the inspection station where the work occurs.

Another phase of the new inspection aids program is the initiation of glass fiber cloth master templates for use in checking the types of fasteners installed in an F-89D wing panel or other large surface. A transparent overlay is literally laid on the surface to be inspected. Lines on the template indicate the proper fastener for each hole.

Thus far Northrup has issued inspection aids covering nearly all of the critical assembly parts of the F-89D. The company expects to convert completely to this inspection system gradually.

In addition, studies are being made to determine the value of applying the same techniques used in inspection aids to actual production of aircraft assemblies. It is believed that a combination of photographs and illustrations with strategic callouts can effectively replace blueprints in production departments with the same savings in time.



Group of permanent mold aluminum alloy pistons, illustrating a number of the types used in modern engines.

Basic Production Methods for Aluminum Pistons

This Is the Second Article of Three Devoted to Aluminum Pistons and Based on Material Presented at a Symposium Conducted by the Cleveland Branch, Aluminum Co. of America. Part III Will Appear Soon.

THE permanent mold method of casting is employed almost exclusively in the production of aluminum alloy pistons. Among the advantages of this process are: (1) a degree of dimensional accuracy which minimizes subsequent machining and finishing of the work, (2) adaptability to the type of aluminum alloy most suitable for pistons, (3) use of a relatively low cost form of aluminum alloy, (4) it permits development of a rather complex cavity in the piston for best distribution of metal.

A five-section main core assembly is used in most modern permanent molds for the casting of aluminum alloy pistons. Two piston pin boss-forming sectors and three center sectors make up the core assembly. The outer sectors of the center core are loosely connected to the center wedge or key sector of the core assembly.

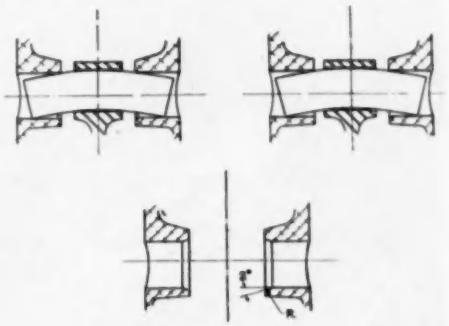
Draft of permanent mold castings varies somewhat with location and is determined to some degree by the tendency of solidifying metal to shrink toward or away from portions of the mold or core. In most cases a desirable minimum draft angle is 10 deg, but this may be reduced or increased, based on considerations of specific areas in the piston.

Very thin walls in permanent mold castings have a tendency toward surface roughness and internal unsoundness. This condition is especially noticeable in the sections adjacent to inserts or struts. Heavier sections in the aluminum piston are necessary in these areas to minimize the chilling effect of the steel inserts.

Pistons today are balanced to a very close weight tolerance. This necessitates the inclusion of balancing metal in the casting which can be removed to any desired extent by machining. The balancing metal should be well distributed on the internal contour of the piston to prevent the feeding from heavy balancing sections to lighter adjacent sections during the solidification of the piston in the mold, thus avoiding unsoundness or voids in the heavier sections. Also, consideration should be given to the placement of balancing metal from the standpoint of its effect upon the rigidity of the piston skirt and ease with which metal may be removed when balancing.

To be satisfactory for use in pistons an aluminum alloy must have high strength, resistance to creep, dimensional stability, wear and scuffing resistance, good machinability and good thermal conductivity. Each of the major alloying elements in an aluminum

One of the many automatic permanent mold casting machines on the piston line in Cleveland.



Effect of deflections of the piston pin on aluminum bosses. The lower section gives the recommended chamfering of the inner edge of the piston pin bore.

piston alloy has a definite effect upon one or more of these properties. Copper has the effect of improving the strength of aluminum alloys and their machinability, while the addition of silicon improves the foundry or casting characteristics of the aluminum alloy and lowers its coefficient of thermal expansion. It has been determined that magnesium will act as an auxiliary hardening agent in the alloy and in proper proportion to copper will minimize residual growth. The addition of nickel improves high temperature mechanical properties, and acts to lower the coefficient of thermal expansion. Currently Alcoa Lo-Ex D132 is used extensively for automotive pistons because of its combination of desirable properties.

Aluminum castings exposed to elevated temperatures for a period of time can experience a permanent increase in volume. This three-dimensional change is referred to as growth, and it is influenced by the composition of the alloy. Proper heat treatment of the piston casting prior to machining can remove the major portion of the growth in the alloy.

The alloying elements go into solution in molten aluminum and a portion of some of the elements will remain in solid solution as the casting solidifies in the mold. Aging of the casting at temperatures in the range of 350 to 400 F will have the effect of precipitating from the solid solution minute particles of compounds formed by the elements. The particles act as keys in the slip planes of the aluminum alloy and improve its strength.

An aging or precipitation treatment without a previous solution treatment of the casting, known as the T5 treatment, for Alcoa D132 alloy consists of heating for eight hours at 400 F. This thermal treatment does not provide maximum mechanical properties, but is designed to produce a piston with adequate strength and low residual growth characteristics.

Aluminum alloys are recognized as having inherently good machinability, but to take advantage of this factor one must be familiar with proper tool design and practices. Three classes of aluminum alloys have been established with regard to their machinability: Type I—excellent machining properties; Type II—good machining properties; Type III—satisfactory machining properties with special techniques.

Silicon is a major alloying element in most piston alloys, but its limited solubility and abrasiveness put the aluminum piston alloys into the category of those requiring special machining techniques and practices.

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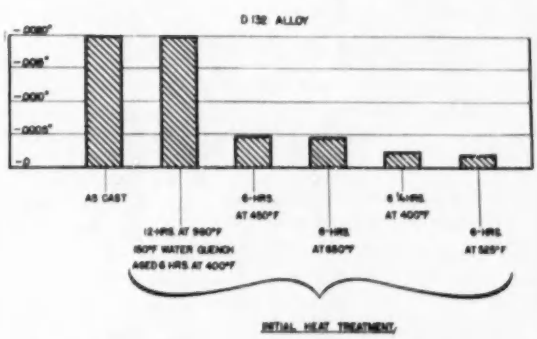
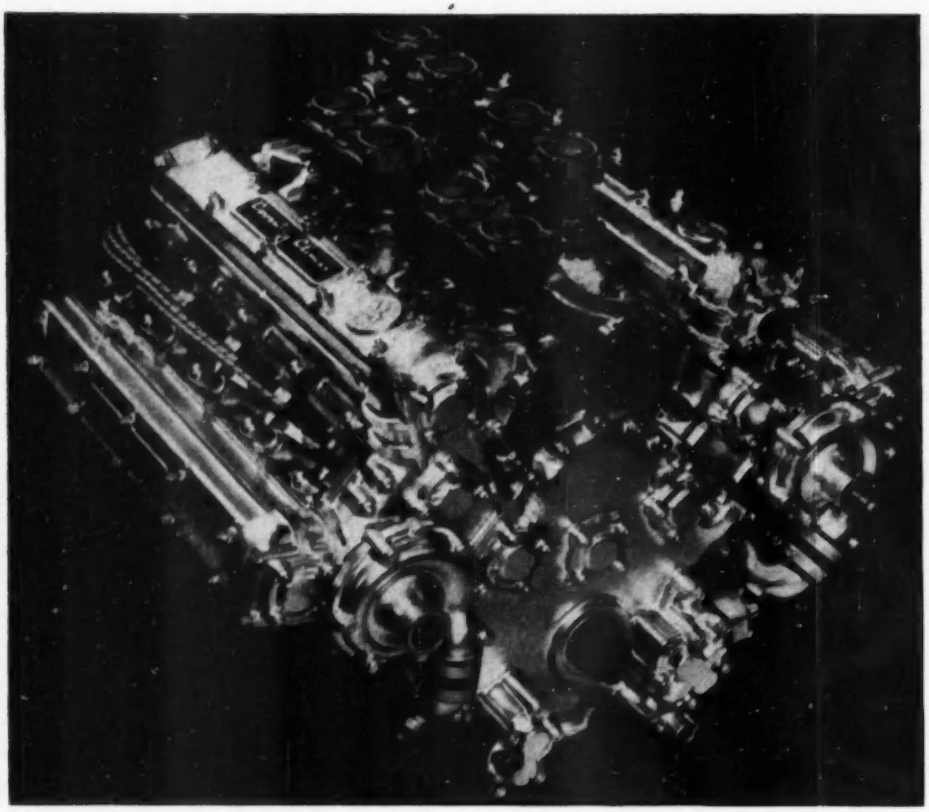
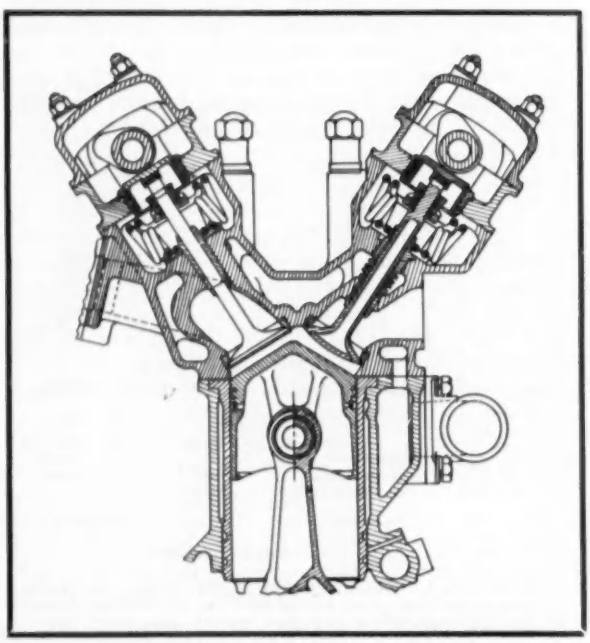


All aluminum, double translot piston design thrustwise dimensional change at top of skirt due to residual growth of piston ring belt. (D132 alloy.)



Right front quarter view of the Coventry Climax engine which uses light alloys for the heads, integral blocks and crankcase, gear case covers, etc.

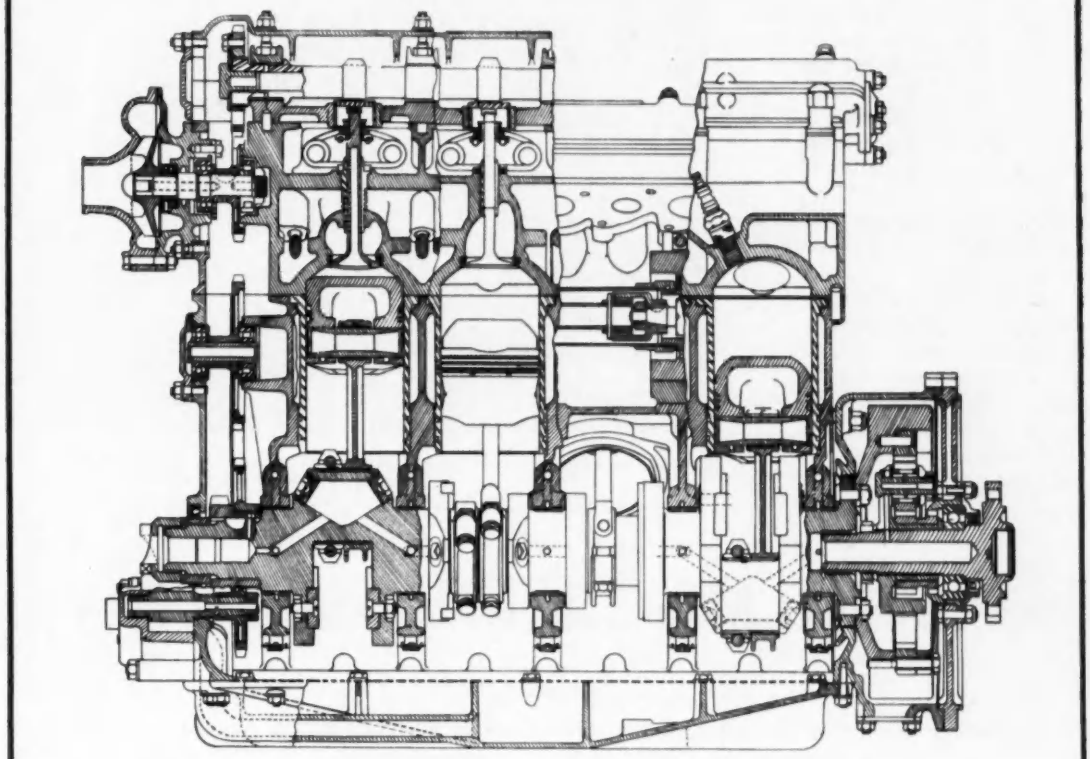
Transverse section of upper cylinder block and head, showing details of valve mechanism.



New British Race Engine of Light Alloy Construction

A NUMBER of engineering refinements are featured in the 151 cu in. displacement V-8 racing engine built by Coventry Climax Engines Ltd., England. Rating of this unsupercharged unit is 250 hp at 8500 rpm. Bore and stroke are 3.000 in. and 2.675 in., respectively, over-square design keeping piston speed down to about 3800 fpm at maximum revolutions. Compression ratio is 11 to 1.

There are four overhead camshafts, two water pumps, and separate oil pressure and scavenging pumps driven by gear trains from the crankshaft. Valve tappets are small inverted pistons spaced from the stems by internal thimbles which are ground to adjust clearances. Exhaust valve guides are direct water-cooled. Hairpin type



Longitudinal section of the engine.

springs are used on intake and exhaust valves.

The four dual throat carburetors are mounted on short individual manifolds within the V, with the magneto at the rear driven by a torsionally flexible tube. Pistons, cylinder heads and the integral block and crankcase are of aluminum alloy. Wet cylinder liners are cast iron. Main bearing caps of the five-bearing balanced crankshaft are secured by transverse bolts to the ribbed crankcase as well as by conventional vertical studs.

Overall engine dimensions are length 22½ in., width 28 in., and height (less carburetors) 20 in.

• • •

Spotlight Turns on Plastic Applications at Cleveland

Experts from four major industries have been selected to review applications and discuss the future of plastics in their fields at the Annual Plastics Conference that will run concurrently with the 1954 National Plastics Exposition. The Exposition, sponsored by The Society of the Plastics Industry, Inc., will be held June 7-10, at the Public Auditorium, Cleveland, O.

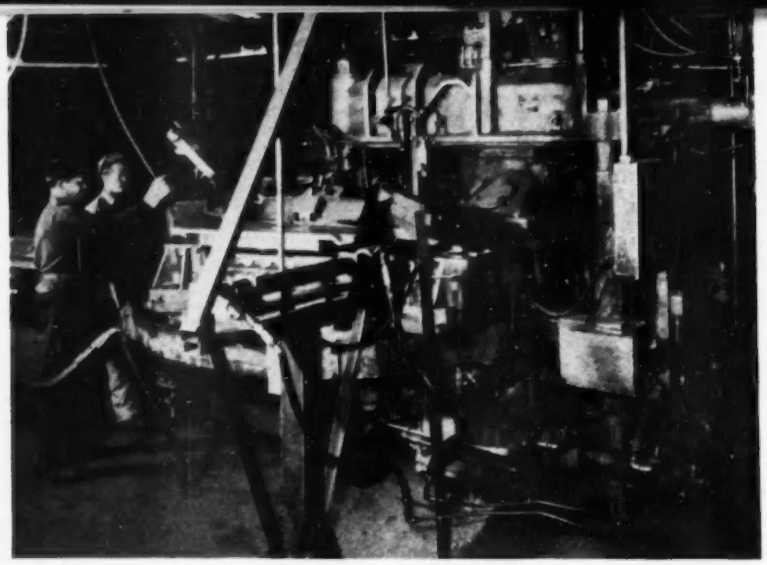
This year's sessions accompanying the exposition will feature these large plastics-consuming industries: radio and television; rubber; refrigeration and air conditioning; and automobiles. An additional feature is a review of new plastics materials.

The Exposition itself, of course, will not be limited to these four industries. All phases of plastics manufacture will be represented—molding, lamination, extrusion; fabrication; reinforced plastics products; film, sheeting and coated fabrics; raw materials; machinery and equipment including tools, dies, molds; and testing and research methods.

The symposium on plastics in the rubber industry, to be held the morning of June 8, will cover such topics as extrusion and molding developments and processing and applications of various materials. The forum on plastics applications in automobiles, to be conducted the morning of June 10, will feature discussions on such subjects as: general automotive uses; cast dies; plastic tooling; epoxy plastic dies; die models; checking fixtures; tooling; and the Corvette body.

Caterpillar Forms Credit Corporation

To assist its dealers in financing time payment sales, Caterpillar Tractor Co. has formed a new wholly-owned subsidiary to be known as Caterpillar Credit Corp. The credit corporation will be located in Peoria, Ill., site of the parent company.



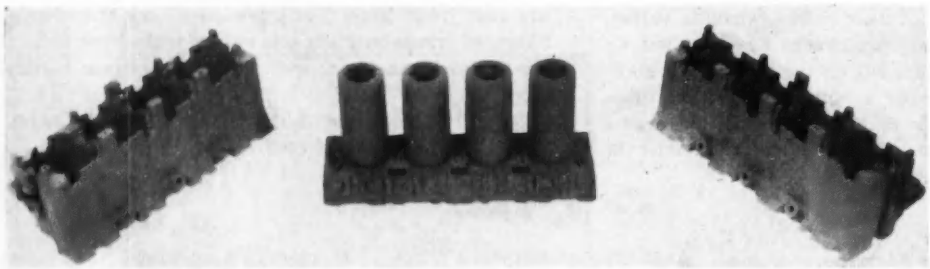
One of the five-station automatic Osborn core blowers installed in the Cadillac foundry in Detroit.

More Cores per Man-Hour with Automatic Machines

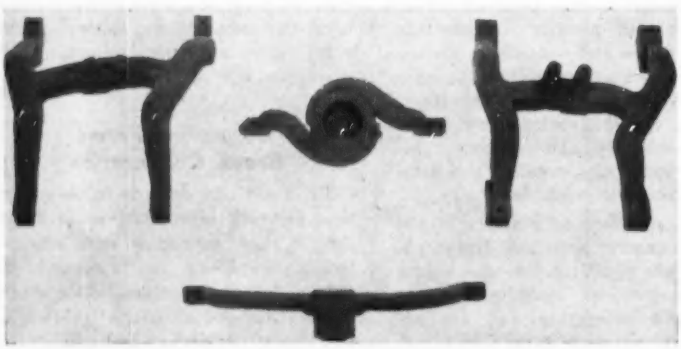
AUTOMATION in the area of foundry operations has been the goal at Cadillac where the foundry management is conscious of the possibilities of fuller utilization of manpower, methods, materials, and equipment. Although progress in this direction is necessarily slow, Cadillac has taken a major step with the installation of two- five-station, automatic core blowers of multiple action type which have been in use during the past year.

Cadillac operates a gray iron foundry with maximum capacity of 400 tons per 16-hour day, and produces more than 40 different kinds of castings for engines and transmissions. These range in weight from 0.46 lb for a rocker arm bracket to 235.33 lb for a cylinder block. Of these, some 27 castings require a total of 86 different cores ranging in weight from only 0.01 lb for a plug core, all the way up to 80.30 lb for an unassembled crankcase core.

The automatic core blowing machines adopted by Cadillac are of "Roto" type, consisting of a special core blowing mechanism and roll-over draw apparatus interlocked with a five-station indexing turntable. Dump-type core boxes are so designed as to accommodate a variety of different cores, thus promoting flexibility of operation. Boxes are of open type, each with a sub-blow plate attached to the cope. Special control buttons allow the turntable, blower, or roll-over draw to operate independently and thus facilitate maintenance.



These large cylinder block cores represent the range of core size for one of the Osborn machines.



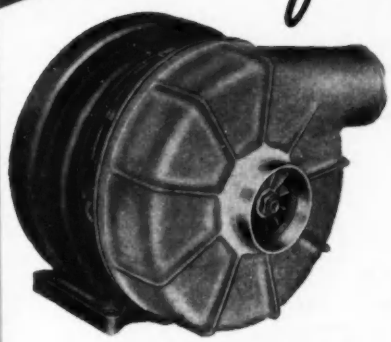
Manifold and water pump cores, seen here, indicate the range of size produced on the second automatic core blower.

The machine can blow up to 421 cores an hour but is arranged to operate on a 10-second cycle, blowing 360 cores an hour with two men. One of the machines requires three operators because of the nature of the particular jobs that it handles.

(*Turn to p.* 110, *please*)

USE SCHWITZER-CUMMINS DIESEL ENGINE EQUIPMENT

for Greater Operating Economy



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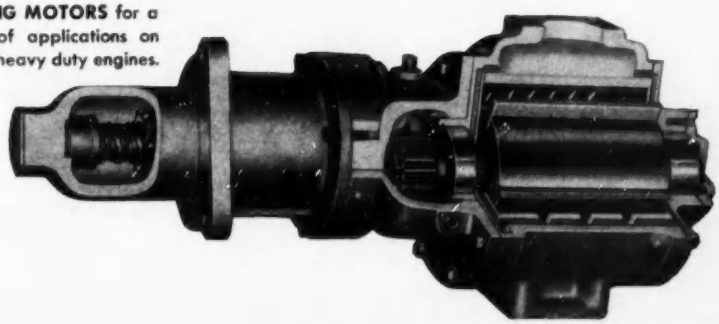
All of our products for your Diesel engines are engineered for your particular application and requirements. More than one-third of a century of research, intensive engineering, broad field experience with unexcelled manufacturing facilities are back of our products. We gladly offer our engineering assistance and our extensive facilities to produce and serve you efficiently.

THERMOSTATICALLY CONTROLLED COOLING FANS AND FAN DRIVES. Available for installation by owner on many makes and sizes of heavy duty engines.

POSITIVE DISPLACEMENT SUPERCHARGERS for engine sizes from 50 to 500 HP and pressure ratios of 2:1 max.

AIR STARTING MOTORS for a wide range of applications on many sizes of heavy duty engines.



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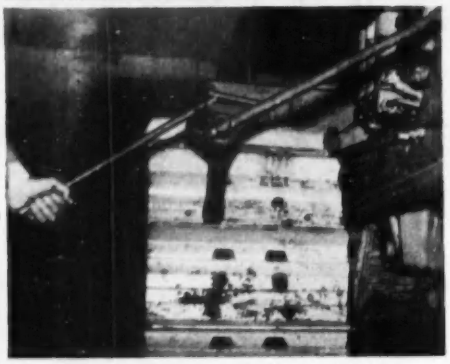


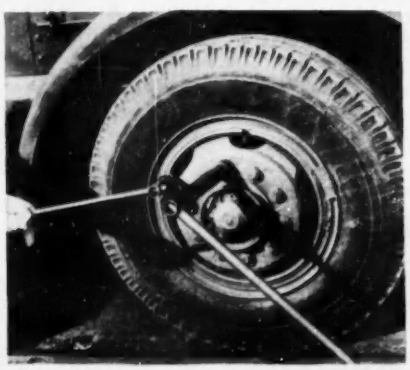
Shelby and Sweeney tame a tough nut

• The Sweeney POWERENCH is a rugged nut turning tool specifically designed with geared action for tightening or loosening the nuts on dual wheels, aircraft propeller shafts, diesel engine cylinder heads, railroad locomotives, and for countless other heavy-duty applications.

Super tough equipment calls for super strong materials. That's why Shelby Seamless Mechanical Tubing—in sizes from 1⅛ in. O.D. to 5⅝ in. O.D.—is used in the manufacture of POWERENCH assemblies. The great strength, complete uniformity, and extreme dimensional accuracy of Shelby Seamless make it the ideal mechanical tubing for the fabrication of such heavy-duty materials. Moreover, it is safe and workable—possessing excellent machining and superior welding properties.

Produced to exacting standards by the world's largest manufacturer of tubular steel products, Shelby Seamless Mechanical Tubing is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses. Call on our engineers for recommendations. They will be glad to make a study of your particular requirements and help you apply Shelby Seamless to your specifications.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

USS SHELBY SEAMLESS MECHANICAL TUBING

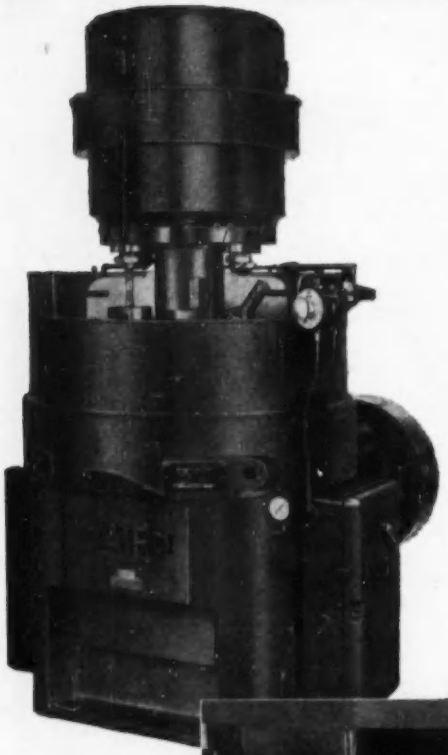
USS

4-1228

UNITED STATES STEEL

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING

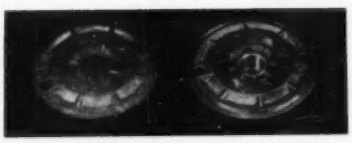


TOOLS MOVE HORIZONTALLY, OTHERS VERTICALLY, FOR FACING . . . TURNING

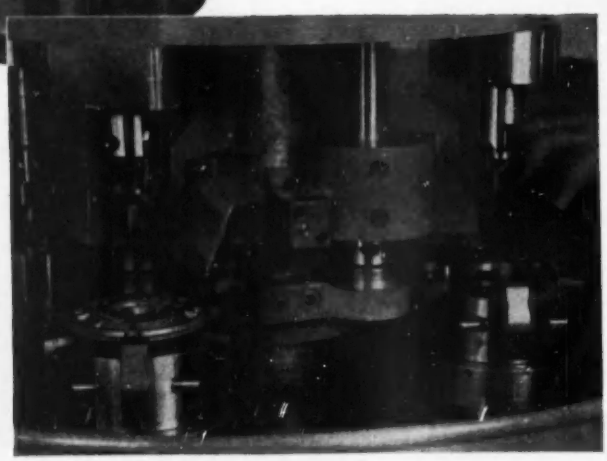
. . . and that's but one of the excellent features of Baird's No. 54VC (5" chuck, 4-spindle, vertical continuous lathe). As the turret revolves, eliminating unproductive indexing time, holding fixtures grip and release automatically for easy loading and unloading. Tools feed in and out of the cutting stroke.

This typical Baird tooling set-up bores the hole, faces and chamfers the hub, and turns the flange of a generator end plate. Cycle time 19.48 seconds, 5 seconds per piece, 720 per hour. Feed: boring hole and facing hub .0039" . . . turning flange .005" and .002" (forming tools). Cutting speeds: boring 348 ft.; turning 1985 ft. per minute.

Safety for operator and prevention of machine and product damage are mechanically and electrically controlled; tools cannot feed to work unless spindles are revolving; electrical equipment is enclosed, wiring concealed.



BEFORE AND AFTER



(Above) Front view, showing splash guards for wet cutting.

(Right) Tooling set-up for finishing a generator end plate.

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1. Compact design.
2. Easy to tool and operate.
3. Simple . . . dependable.
4. Extremely accurate.
5. Unusually versatile.
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Last Thousands of Miles Longer

Freedom to Turn in Either Direction—

- **Prevents formation of stem and uneven seat deposits**
- **Prevents sticking and scuffing**
- **Prevents burning and guttering**
- **Effects an appreciable increase in valve life**

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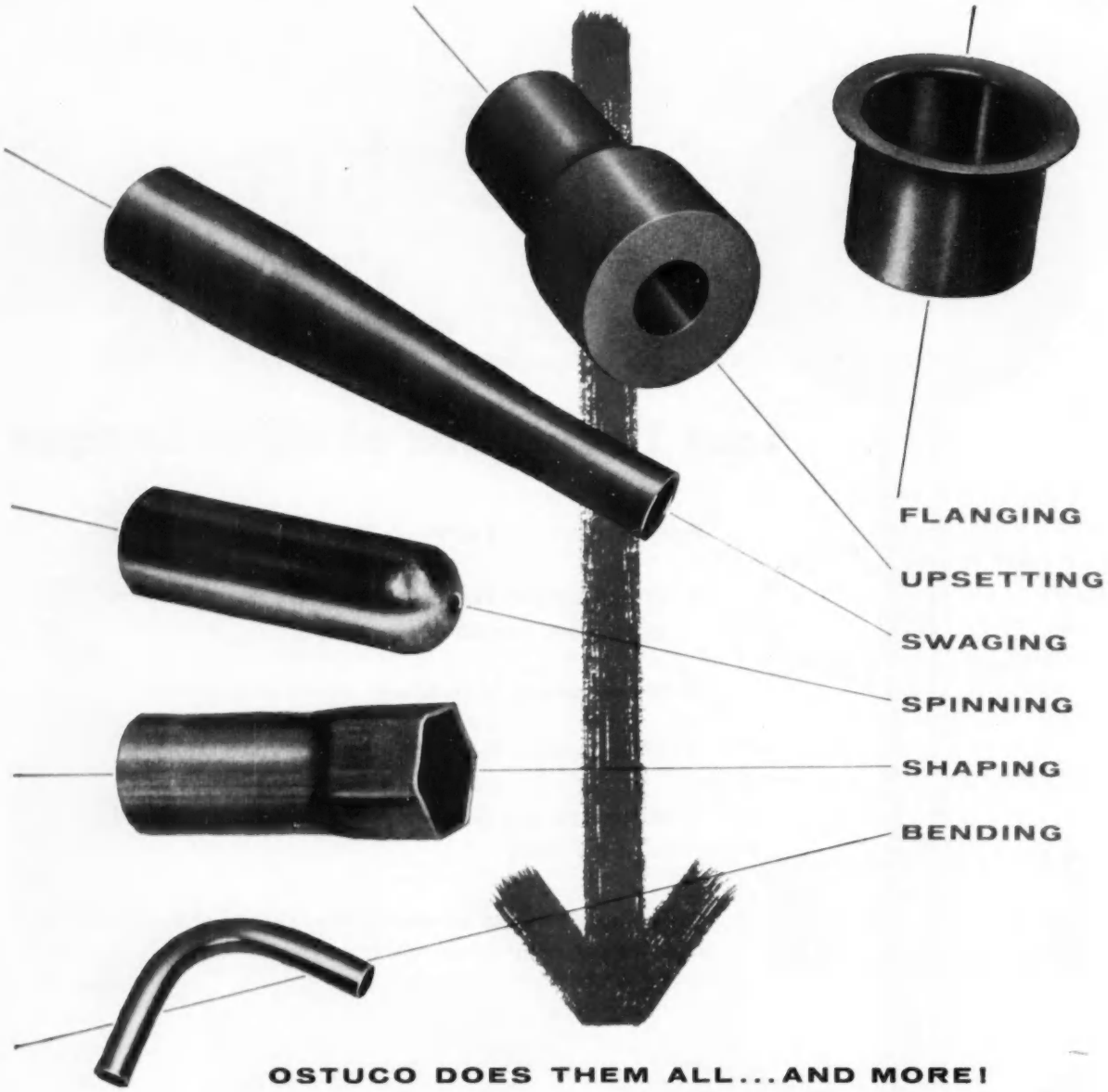

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

An Unusual Opportunity For Stabilization of the Machine Tool Industry Is Provided by Existing Conditions, according to Herbert L. Tigges

NMTBA Prexy Foresees Stabilization

Addressing some 350 executives who represent over 85 per cent of the U. S. machine tool production, Herbert L. Tigges, president of the National Machine Tool Builders' Association and executive vice president of Baker Brothers, Inc., stated that today's circumstances provide a unique opportunity for long-term stabilization of the machine tool industry. Mr. Tigges' remarks were made in the opening address of Spring Meeting of the NMTBA held in Chicago last month.

He continued, "We have certain factors existing in a combination which we never had before:

"First—A continuing high level of industrial production throughout the country;

"Second—The greatest accumulated obsolescence, in metal-cutting and metal-forming equipment, in the nation's history;

"Third — A competitive situation among our customers that is bound to make them extremely cost-conscious;

"Fourth—National defense requirements regarded as continuous, instead of emergency business;

"Fifth—A more understanding attitude, on the part of Government, than we have had for many, many years."

"Let's decide that the old machine tool cycle theory is obsolete, and prove it."

The industry's main sales opportunity, Tigges said, lies in the replacement market inside the United States.

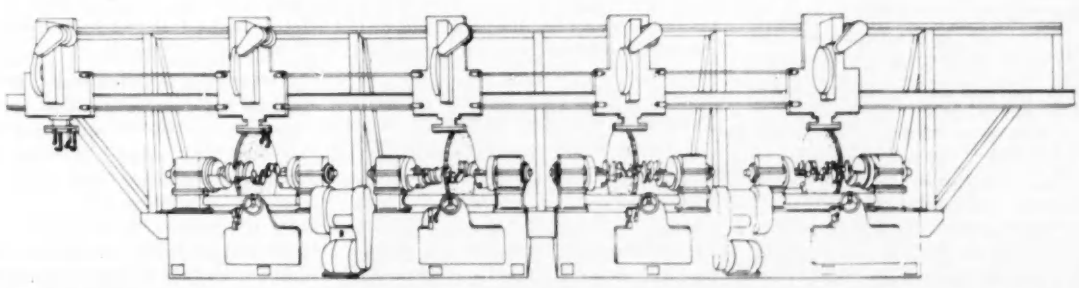
"We know the extent of obsolescence," he said, "that obtains today in the Nation's metalworking plants. We know that we have the products to overcome that obsolescence, and increase, by an incredible total, the productivity of the United States. However, we must speed up our own rate of redesign to meet the new rapid pace of redesign of product which is today sweeping all American industry."

Louis Polk, president of Sheffield Corp., and 2nd vice president of the NMTBA, informed members that the committee for the 1955 machine tool show will include in its rules that all machine tools displayed at the exposition must be painted light machine tool gray (7-B) unless the Association decides to adopt a new standard color before the show is held. Reporting further, he stated that the NMTBA color committee suggests that machine tools at the show will look more attractive with chrome plated operating handwheels and knobs, and with graduated dials finished in the new satin finish.

A report written by Charles S. Davis, Jr., vice president of Lake Erie Engineering Corp., and chairman of the NMTBA subcommittee on procurement policy, was read by Alan C. Mattison, president of Mattison Machine Works, and a member of the committee. The paper cautioned machine tool builders on two contractual matters. The first of these deals with specifications demanding shielding of machines against interference with radar and radio. These specifications may only be listed in the contract by number. Another item to be on the alert for, according to the procurement committee, is where the contract calls for demonstration by the supplier. One Government plant being unable to install equipment when delivered by tool builders placed it in storage and endeavored to withhold an arbitrary amount of the contract price to cover demonstration at some unspecified future date.

When discussing the problem of Government relations, M. A. Hollengreen, president of Landis Tool Co., and 1st vice president of the NMTBA, stated that any company that ignorantly agrees that a machine tool should be depreciated over its physical life without regard to obsolescence and technical improvements does a real disservice to the industry. It is up to every company to satisfy the Bureau of Internal Revenue on an individual basis that its depreciation is reasonable and allowable. Concerning renegotiation, Mr. Hollengreen stated that the company that inadequately presents its case to the Renegotiation Board without showing any concern about Government surplus or saturation of market leaves the Board with the mistaken impres-

(*Turn to next page, please*)



Sketch of the fully-automated Norton crankpin grinder which will be used for crankshafts of a 1955 model OHV, V-8 passenger car engine.

sion, to the detriment of all companies, that the industry does not really have a serious problem. He continued, "The great benefit to all of us from our membership in the association is the opportunity from time to time, through association meetings and committee meetings, to educate and inform ourselves on our problems so that, in our relations with Government officials, we will be better able to keep them fully informed and cognizant of our mutual problems."

According to Ralph S. Howe, president of New Britain Machine Co., and chairman of the NMTBA committee on permanent defense capacity, the Defense Department now has a new recorded inventory of 288,000 machine tools, all Government owned. The quantity of tools represents the maximum production of the machine tool industry running at $1¼ billion per year for a period of three years. He went on further to say that this quantity does not represent a complete inventory of Government-owned equipment.

Tell Berna, general manager of the NMTBA, gave three major factors that probably will influence an increase in machine tool sales for 1954. These three factors or markets are the automobile industry, the modernization plans of American metalworking industry generally, and the defense plans of the U. S. Government. Mr. Berna said, "As you know, the automobile industry has been tooling up for new features, notably power steering, power braking, automatic transmissions, and V-8 engines; and their expenditures in 1954 are likely to be higher than they were in 1953."

GI Tool Funds

Refusal of the House of Representatives to renew the $250 million Defense Dept. fund for purchase of machine tools actually makes little or no difference to Pentagon procurement chiefs. They still have full authority to place orders for machine tools at any time they see fit—either in this fiscal year or in the new fiscal year beginning July 1. Only difference is this: After July 1, purchases of tools will be made from funds set aside for "major procurement," rather than from the special $250 million tool fund that will lapse on June 30. This means that the Army, Navy, and Air Force may buy such tools as they require from "major procurement" funds. Secretary of Defense Charles Wilson takes the position that tool buying will not begin until the Defense Dept. completes an accurate inventory of what tools it already owns. This inventory is far from complete, although it has been under way for over a year.

Result of the house action does not necessarily mean that the Government is cutting back its tool-buying program. Basic plan still is the same, namely, find out what we have, then determine what we need and order it.

Now—Automated Crankpin Grinders

Norton Co., Worcester, Mass., has made further progress toward making engine production lines fully automated. According to a statement issued by the company, the highest degree of automation in metal-working today exists in the automobile industry; that is, all but precision grinding operations because of the difficulty of obtaining close tolerance of mating parts without proper attention.

Now, after much research, Norton has under construction two transfer type crankpin grinders for one of the V-8 OHV passenger car engines which will make its debut in 1955 models. The machines will have four stations with each station having two 42 in. diameter grinding wheels. In addition to automatically loading and unloading along with the grinding cycle, the machines incorporate automatic wheel truing and automatic inspection after each crankpin is ground.

Suit Against Three Firms Ends in Five Hours

In less than six hours after it was filed in a Federal court in Detroit, an anti-trust suit against three firms was settled between attorneys for the companies and the Government.

Defendants were Cincinnati Milling Machine Co., Cincinnati Grinders, Inc., and Kearney & Trecker Corp.

In conforming with a consent judgment, filed at the same time as the initial complaint, the defendants agreed to desist from fixing prices, from limiting allocation of patents to certain markets or customers, and from granting licenses to manufacture only to companies buying materials from them. The companies also agreed to furnish certain specifications and drawings to licensees for the next five years.

Around the Industry

E. W. Bliss Co., Rolling Mill Div., Salem, Ohio, has acquired the manufacturing rights to the Weld-A-Matic splicer from the dissolved Arms-Franklin Corp. The agreement transfers to Bliss patent rights, engineering drawings, service, operating and empirical data.

Allis-Chalmers claims that variable pitch drives continue to gain in preference. About one-sixth of the total new sheaves now manufactured at the company's Norwood Works are of the variable pitch type. This is approximately twice the ratio at the end of WW II.

Induction Heating Corp., Brooklyn, N. Y., is now offering its Ther-Monic equipment on a rental basis. Two rental plans are available.

SKF Industries, Inc., Philadelphia, Pa., is supplying self-aligning spherical roller bearings for a large 18 in. tube reducing machine having 50 in. diameter rolls. The machine, designed by Tube Reducing Corp., Wallington, N. J., uses bearings 48.0315 in. OD by 17.2441 in. wide. Capacity of the bearings is approximately 3.5 million lb.

Sundstrand Machine Tool Co., Rockford, Ill., reports sales and earnings in the three months ended March 31 again reached record highs. Bruce F. Olson, president of the firm, stated that net sales of $11,150,000 were up from $10,240,000 in the first quarter of 1953, and unaudited net earnings were approximately $730,000, as compared with $562,000 in 1953's first quarter.

Tool Engineers Vote $100,000 For Research

At its 22nd annual meeting in Philadelphia the American Society of Tool Engineers voted to add $100,000 to its fund for research in production methods. The sum will be used by the Society's research fund committee, which is made up of members from the top ranks of industry. The fund is operated separately from the Society's regular functions of aiding industry.

Welding Expenditures Cited

Almost $614,000,000 was spent for welding equipment and supplies during 1953, Fred L. Plummer, president, American Welding Society, disclosed at the society's Spring Meeting in Buffalo last month.

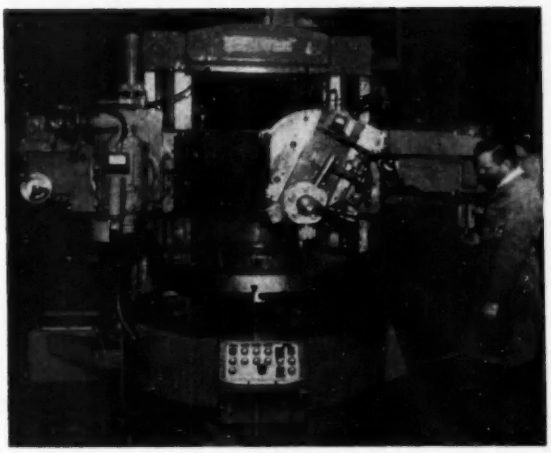
Production of electrodes for arc welding has jumped five and one-half times since 1936, he said, and resistance welding machine sales have jumped to more than nine times their 1939 level. "Oxygen sales have risen from 100 million cu ft 40 years ago, to 23 billion in 1953, while acetylene in the same period rose from 121 million to more than six billion cu ft," Mr. Plummer said.

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Grinding Precision Diameters

A precision turning and grinding machine developed especially for the jet engine industry, but applicable to any work on which exceptional tolerances are required on concentricity and parallelism of turned and ground surfaces, has been announced.



The Frauenthal 3100 Series precision turning and grinding machine.

Designed to perform multiple turning or grinding operations in one setup, the 3100 Series machine includes four table sizes—36, 42, 48 and 52 in., all with a 60-in. swing.

Power for driving the work table is provided by a 10-hp d-c drive unit, with power transmitted to the table spindle through a timing belt. The work spindle pulley is ball bearing mounted in a heavy housing, bolted to the lower area of the base. All radial load on the pulley is taken on its own bearings, and is not transmitted in any way to the table spindle. All other movements have their own power source.

The table is seated on, and securely bolted to a large-diameter flange on the spindle. The spindle assembly is a self-contained unit, consisting of a rugged spindle carried by extra-large, preloaded, anti-friction super precision bearings in the spindle housing.

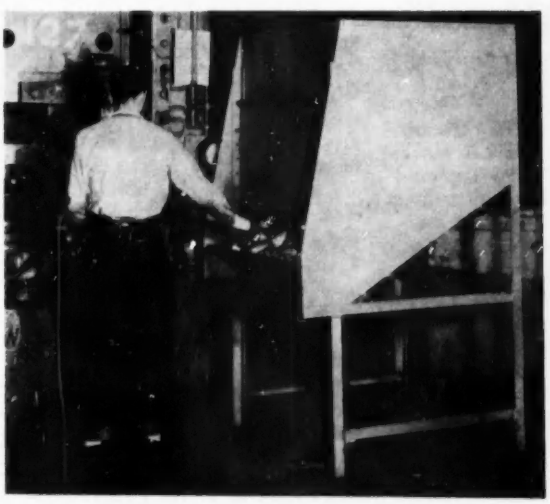
The right-hand saddle, or compound, mounts a hydraulically actuated turret slide equipped with a cam-locking, manually rotated five-station tool turret. The left-hand compound is equipped with a direct connected self-contained grinding spindle and is capable of an eight-in. hydraulically actuated vertical stroke, plus four in. of manual adjustment.

The upper or load-carrying bearing is an oversize, ultra-precision, double-row tapered roller bearing. The lower or aligning bearing is a similar straight roller bearing. Each bearing can be pre-loaded. The lower bearing is designed to permit housing or spindle thermal expansion. The spindle can be arranged for electromagnetic chucks mounted on the work table.

Table speed is electronic potentiometer-controlled up to 175 rpm, or in higher speed ranges to meet customer requirements. Dynamic braking of the table and jog button control are standard equipment. All horizontal and vertical feeds are hydraulically actuated to provide infinitely variable feed rates.

Optional equipment includes a wide variety of grinding spindle designs either as an accessory or in place of the direct connected spindle furnished as standard equipment. These include belt-driven and other type spindles for small-bore grinding, deep-hole grinding, etc. Hydraulically actuated straight, radius and combination radius-angle and special dressers are available. *Fruenthal Div., Kaydon Engineering Corp.*

Circle 56 on page 89 for more data



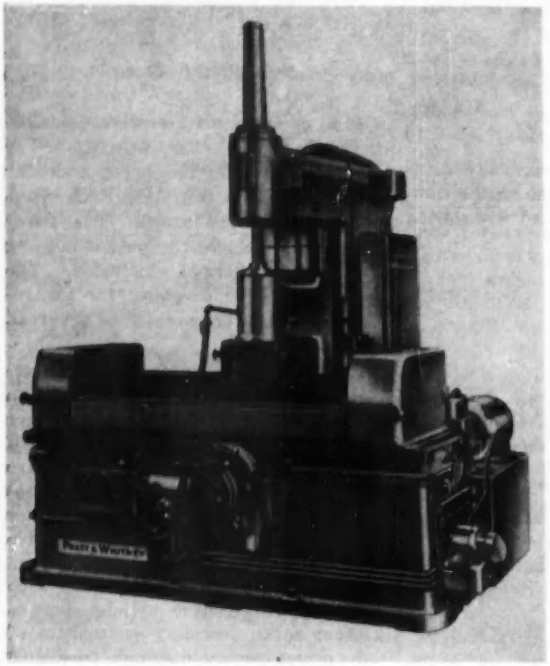
Compact Hopper

A gravity-fed hopper has been added to the Work-O-Matic system of materials handling products. The new unit is specially designed to provide vertical mass material supply at the use point in congested work areas. Tray-end is removable for fast job finish-off. Flow of material is regulated according to piece size by an adjustable control gate. (Union Metal Mfg. Co.)

Circle 57 on page 89 for more data

NEW EQUIPMENT — PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89



The P & W Model D hydraulic vertical surface grinder.

More Rigid Vertical Surface Grinder

A greatly improved 14-in. hydraulic vertical surface grinder features more rigid design throughout and higher table speeds. The Model D is available in either a 14 by 36 in. or 14 by 60 in. size with solid ring wheel, or 17 by 36 in. or 17 by 60 in. size with segmental wheel.

Increased length and depth of the heavily ribbed bed give greater support to the table and column. Wider wheel head ways together with an increase in the column bearing length provide the spindle head with additional support. The spindle is made heavier with more rigid bearing construction. The wheel flange is an integral part of the spindle. Approximately a 25 per cent increase in the weight of the grinder has resulted because of this new design.

Higher table speeds infinitely variable and uniform from two to a 100 fpm permit the use of much harder, longer lasting wheels, thus lowering wheel costs. This range provides a grinding speed for almost any material.

The table traverse is operated by two hydraulic cylinders. Speed is controlled by metering the oil in the return lines—surge, creep and coasting are completely eliminated. The hydraulic system consists of a 50-gal reservoir equipped with a 30 gpm variable delivery pump.

Power is provided by a 30 hp motor that is regularly furnished. (A 40 hp motor is available if desired.)

Other features of the P & W Model D include: Positive lubrication to the table ways by a continuous automatic pressure system having visual glass in each line; general lubrication by a one shot lubricator. The Model D meets JIC standards—*Pratt & Whitney Div., Niles-Bement-Pond Co.*

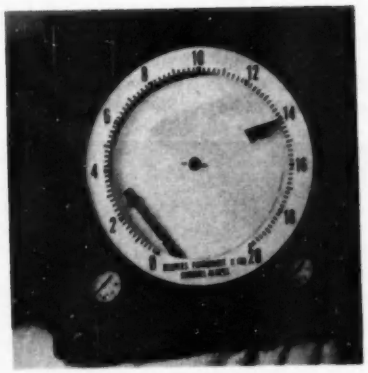
Circle 58 on page 89 for more data

Recording Controllers

A line of process instruments, including potentiometric and a-c bridge recorders and recording controllers, has been designed for continuous measurement and control uninterrupted by periodic standardization. Among the new features are a magnetic standard in the potentiometric system and a bridge-balancing unit in the a-c bridge system.

Both models are available with either electric or pneumatic control, and are equipped with a unique centerless pointer that simplifies chart changing and leaves practically all of the chart exposed to view for easy reading.

The new magnetic standard eliminates dry cells, slidewires, and many moving parts found in conventional potentiometric instruments.



GE process recorder.

Heart of the a-c bridge system, the new bridge-balancing unit supplies power to the bridge and provides a means for rebalancing it. In cases where the variable under measurement is temperature, the circuit is unbalanced by changes in the resistance bulb. Balancing is achieved by a servo motor whcih repositions the balancing unit's rotor.

Other advantages of the equipment include plug-in components, antibacklash gearing, internal illumination, and an integral pen-inkwell assembly designed for automatic realignment.

The reinforced steel case and die-cast aluminum cover are sealed with Neoprene gasketing against dirt and moisture, and can be furnished for either wall of flush mounting. *General Electric Co.*

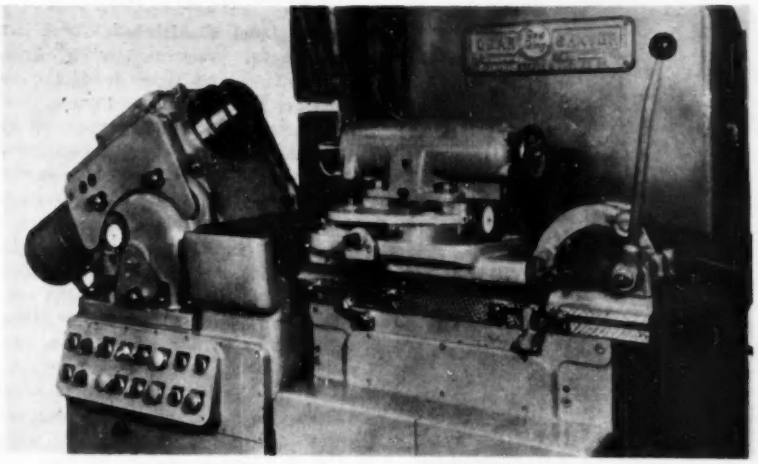
Circle 59 on page 89 for more data

Four Wheel Banty

A new four-wheel Banty gasoline tractor, Model 460, for use in the Trackless Train system of material handling, has been developed.

The standard model is rated at 2300 lb maximum drawbar pull and the heavy duty model at 3000 lb maximum drawbar pull. Outside turning radius is 62 in., only slightly greater than the three-wheel Banty. *Mercury Mfg. Co.*

Circle 60 on page 89 for more data



A closeup view of the Model GCR shaver showing how the workhead pivots to facilitate loading and unloading of internal gears having either wide faces or integral long shafts.

Shaves Internal Gears Only

A new Red Ring gear shaving machine specifically for precision shaving operations on internal spur and helical gears from three to 12-in. pitch diameter is designated as the Model GCR. Gears having up to four diametral pitch teeth and face widths up to 2½ in. can be shaved on this model.

The workhead permits taper shaving operations with an optional pivoting feature that facilitates loading and unloading of internal gears such as those having wide faces or integral long shafts. A differential automatic upfeed mechanism includes a master cam that acts as a step-gaging device to accurately control feed increments, finished size, and return to backlash position.

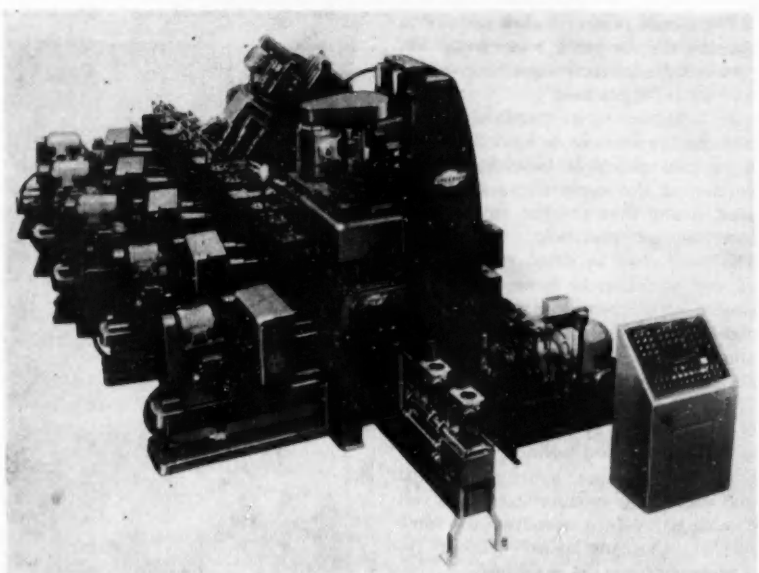
Shaving action is accomplished by the crossed axes principle. The work is mounted on a driving head with its axis in a horizontal plane. A gear shaving cutter engages the work gear with the cutter spindle centerline set at a crossed axis angle with the work gear.

Either conventional or plunge-cut shaving methods can be performed. With the conventional method the work drives the cutter and the cutter is reciprocated across the work face. The cutter is automatically fed vertically at the end of each stroke and allowed to dwell at finished depth before being retracted.

When the higher production plunge-cut method is used, the work drives the cutter the same as with the conventional method, but the cutter is fed to depth without reciprocation. *National Broach & Machine Co.*

Circle 61 on page 89 for more data

Transmission Cases Come Faster



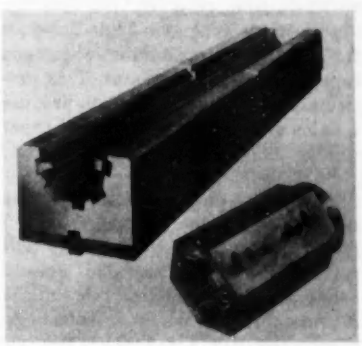
Four transfer machines combine the facilities of 247 tools to complete 265 operations in 29.5 sec, averaging 122 cases per hour at 100 per cent efficiency. The 17-station transfer machine shown, second in the line, performs drilling and reaming operations on the bottom, top, and end of the transmission cases. Outstanding features of these machines are the safety devices. Interlocked steel mesh guards on and between each working station are hinged to allow easy access. Emergency cord will stop the machine from any position along its length. All functions of the machines are hydraulically operated and electrically interlocked. Troubles show up on a system of lights on the control cabinet. (Greenlee Bros. & Co.)

Circle 62 on page 89 for more data

Circular Broaches

A line of broaches finishes external surfaces on circular metal parts such as slots, flats, notches and contours usually produced by index or multiple milling operations.

The broaches are made in a wide variety of sizes in an external surface broach type and an internal type. The surface broach type can be mounted on the ram of conventional single or dual ram surface broaching machines. It broaches up to half of the periphery of a part in a single pass of the broach. If broaching operations are required around the entire periphery, the part, which is



Circular broaches by National

mounted on a fixture on the broaching machine table, is indexed and completed by a second pass of the broach.

The internal type of broach is mounted on the table of conventional utility hydraulic presses and finishes the entire periphery of the part. In this arrangement, the part is mounted on a holder on the end of the press piston rod and pushed down through the broach. *National Broach & Machine Co.*

Circle 63 on page 89 for more data

NEW EQUIPMENT — PLANT • PRODUCTION

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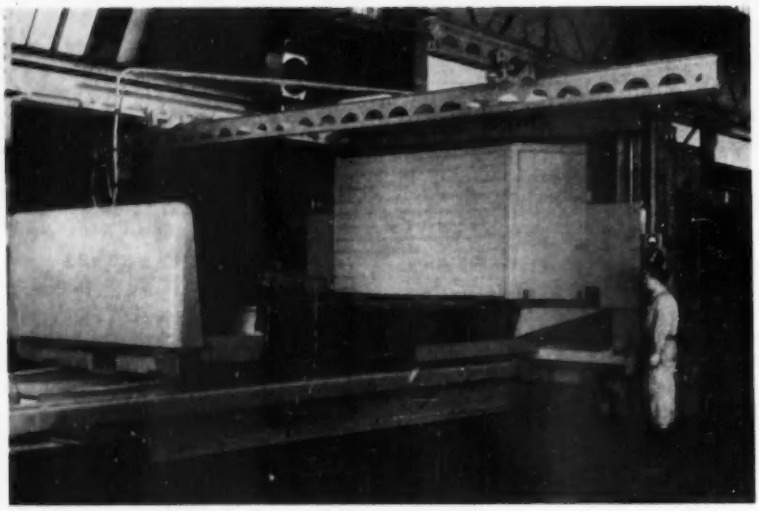
Huge Belt Grinds Aircraft Skins



The Hill double housing abrasive belt grinder for tapered skins.

What is claimed to be the world's largest heavy duty abrasive belt grinding and polishing machine uses an 84-in. wide abrasive belt. The hydraulic table type grinder is designed for accurately machining compound tapers on aluminum plates. This precision built grinder is said to produce a finish superior to conventional taper rolling and milling operations.

The double housing grinder as illustrated is powered with a 250-hp d-c motor, and the positive hydraulic reciprocating table drive of this unit permits instantly variable speeds. Equipped with a coarse grit silicon carbide abrasive belt, it is said to be equally efficient for heavy stock removal and grinding to close tolerances.

The head assembly covers basically a dynamically balanced upper steel idler roll and a lower hard-rubber-covered contact or work roll, over which the abrasive belt travels. The contact roll being the driving roll eliminates slippage of the abrasive belt. Both rolls are provided with a pneumatic brake mechanism.

A pneumatic arrangement for raising and lowering the upper steel idler roll also maintains a constant and uniform tension of the belt.

With both fast and slow motors to operate the elevating screws and adjust belt feed, precision setting within 0.00025 in. is claimed.

In addition to a standard set of rectangular sections to hold the work, a vacuum chuck is furnished. Any portion of the vacuum chuck may be used at any time and the unused part can be automatically sealed off. The chuck can be tilted very quickly in any direction to produce either a single or compound taper; likewise, right as well as left hand sections of aluminum aircraft parts can be produced on the same.

The 84-in. wide by 16-ft. long table is reciprocated by means of two opposed pistons and cylinders together with low pressure hydraulic pumps and valves. A pneumatic contact roll dresser will reface or redress the work roll at operating speed without removing it from the machine.

Auxiliary equipment includes an overhead crane assembly consisting of rails extending to the unloading or discharging end of the machine, together with the bridge rail and a hoist with vacuum cup pick-up. *Hill Acme Co.*

Circle 64 on page 89 for more data

Fine Cutting

The Model C Airbrasive unit can be used for precision cutting, drilling, etching and light deburring on hard brittle materials.

The cutting action is performed by a fine stream of gas-propelled abrasive particles — traveling at near supersonic speeds — directed at the work through a small orifice nozzle. A selection of right-angle and straight nozzles with round and rectangular orifices is available for different cutting requirements. With the smallest nozzle, lines as fine as 0.008 in. can be cut.

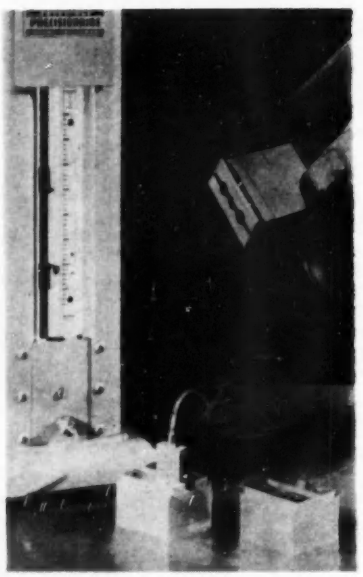
Cutting action is accomplished without the usual increase in temperature ordinarily experienced with other cutting methods. Surface irregularities in the material being worked are said not to affect the accuracy of the cut.

The Model C unit is electrically controlled. Any dry, inert cylinder gas can be used as the propellant gas. A non-toxic specially graded aluminum oxide powder is used for most cutting operations, but a lighter mixture of magnesium and calcium carbonates is also available. *S. S. White Industrial Div.*

Circle 65 on page 89 for more data

Checks Blade Slot

Air gaging has been developed for determining the amount of assembly clearance in the dovetail slots of a jet engine compressor vane support. A column type Precisionaire and a gaging spindle simulates the dovetail root form that fits into the slot in the compressor vane. Variation of 0.0001 in. is amplified to 1/4 in. on the scale. (Sheffield Corp.)



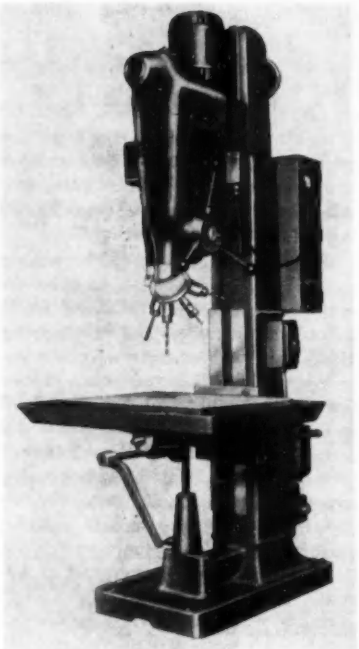
Circle 66 on page 89 for more data

Six-Tool Turret Drill

Up to six different drilling and tapping operations can be completed at one station with a versatile machine now available. The ½-in. capacity spindles are independently set for any speed between 200 and 4000 rpm. Automatic reverse for tapping is available at each spindle.

The turret head features a special self-centering positive drive that automatically locks the working spindle into alignment with the main spindle. Depth stop washers on plunge bolts are accurate to less than 0.002 in. variation. Speed control dogs select high or low motor speed range, and thumb screw controls give infinitely variable spindle speeds in either range. *Howe & Fant, Inc.*

Circle 67 on page 89 for more data



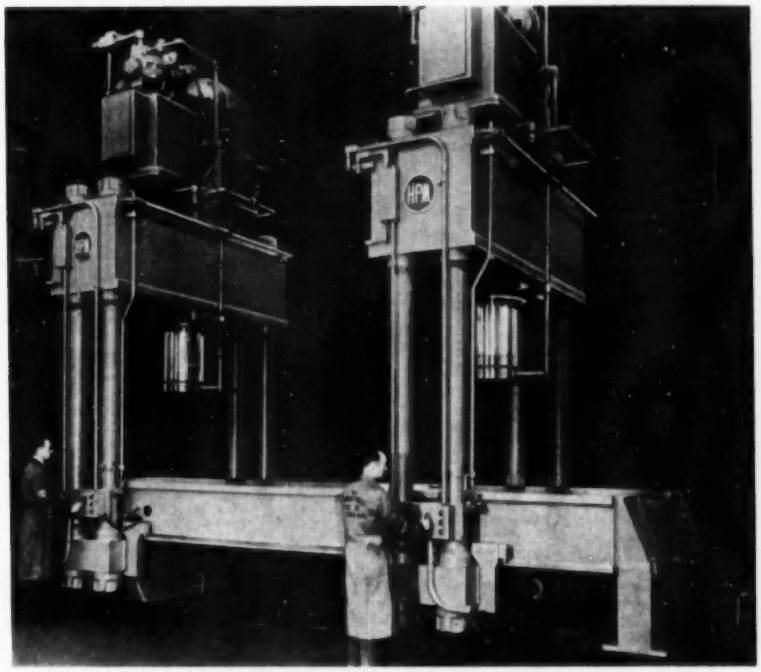
H&F turret drill

Hot-Cold Test

An automatic testing chamber which cycles test parts through alternate hot and cold temperatures, has been announced.

The unit, which has a test chamber 30 in. long by 11 in. wide by 16 in. deep, produces first a low temperature, down to —120 F. It then raises the temperature to +200 F and will repeat the cycle as many as 100 times. Holding time at high and low levels is variable with a dual-set timer which determines half-cycle time anywhere between 0 and 120 minutes. *Cincinnati Sub-Zero Products Co.*

Circle 68 on page 89 for more data



The H-P-M two-way straightening press.

Two Pressure Units for Dual Press

A two-way straightening press with two pressure units—believed to be the first hydraulic press of its type—was designed to straighten parts such as forgings, castings, extrusions and weldments where it is necessary to hold down one point while applying pressure to another point or to apply pressure at two points simultaneously.

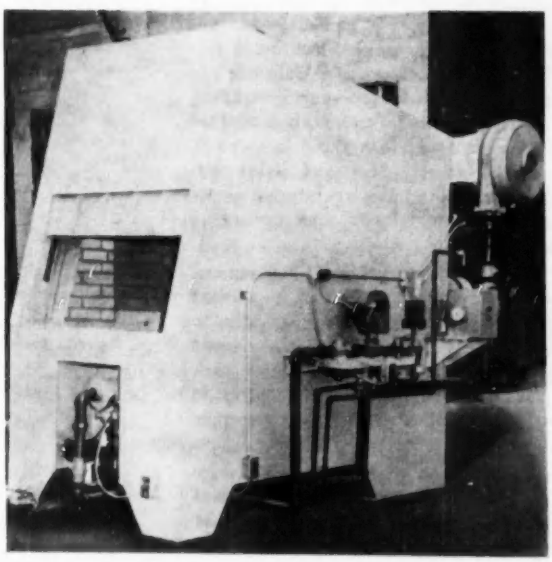
Spot pressure can be applied over practically the entire press bed area because the two pressure units have both longitudinal and traverse movement. Each pressure unit has a pressure capacity of 400 tons and the bed is 264 in. long and 96 in. wide. From each ram nose (ram up) to the bed is 60 in. and each ram has a 24-in. stroke. The press was built for Harvey Machine Co. of Torrence, Calif. *Hydraulic Press Mfg. Co.*

Circle 69 on page 89 for more data

Inside Fan

A modernized convection recirculating forced draw furnace has the fan built-in. It recirculates the hot gases through the work chamber at the rate of 70 complete air changes per minute. The door is air operated. The sloping front design assures a tight seal around the door frame. Temperature range is from 250 F to 1250 F. Other furnaces of this type are available for operation to 1650 F in a wide range of sizes. (Bellevue Industrial Furnace Co.)

Circle 70 on page 89 for more data



NEW EQUIPMENT PLANT • PRODUCTION

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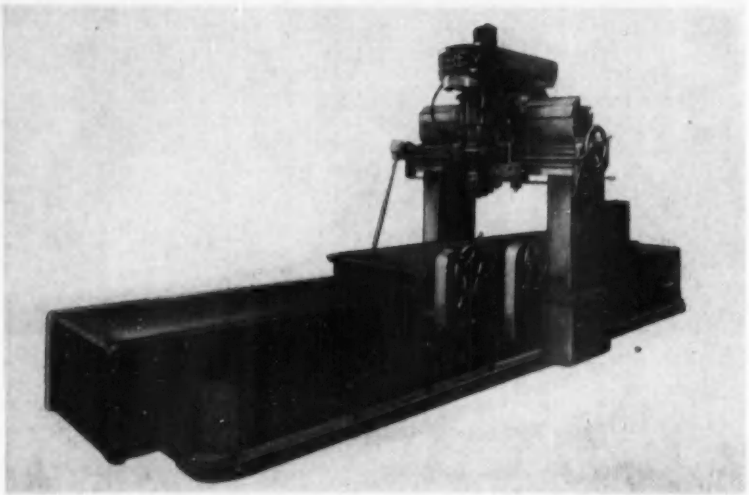
Profile Milling Machine for Tooling Production



The No. 50M Aeroframe profile milling machine was designed for milling irregular-shaped complicated precision parts such as cast iron frames, forgings for aircraft pats, etc. Speed range is 125 to 4600 rpm; hydraulic power feed is available for table speeds from zero to 160 in. per minute. Cross rail and bed have replaceable hardened steel ways. The table and upper carriage carrying the spindle are mounted on roller bearings. Automatic lubrication is provided to spindle bearings and upper carriage; one shot lubrication for table bearings. (Morey Machney Co.)

Circle 71 on page 89 for more data

Versatile Adhesive

Production of an industrial adhesive, which is said to have unique properties for bonding both similar and dissimilar materials, is announced. Known as Phenoweld, this thermo-setting industrial adhesive has been found to have superior bonding ability for metal-to-metal, metal-to-nylon as well as aluminum, steel, brass, copper, glass and nylon adhesions. Of particular interest is its ability to bond nylon to a variety of materials.

It requires no primer. For general applications, it is applied in solvent solution by brush, spray or dip to both parts. When all of the solvent is evaporated, the adhesive is tack free, and remains so. The parts to be assembled are then held together under gentle pressure.

For maximum physical adhesive bond and maximum chemical and solvent resistance, application of heat while the parts to be bonded are held together is recommended. The maker emphasizes that this heat application is necessary only where a high degree of chemical and solvent resistance is required. *H. V. Hardman Co.*

Circle 72 on page 89 for more data

Versatile Switch

A machine tool limit switch, Class 9007 Type T, features the easy adjustment of the basic device to obtain eleven different contact operating sequences—using only a screwdriver.

A variety of operating lever arms are available which can be mounted in any angular position. Although only a small travel is required to operate the switch, a large amount of overtravel, approximately 80 deg, is provided in either direction. Diecast enclosures are fully gasketed with neoprene, making them watertight, oiltight and dust tight. Seven types of baseplates, as well as threaded holes in the side of the diecast box, permit mounting in a variety of positions. *Square D Co.*

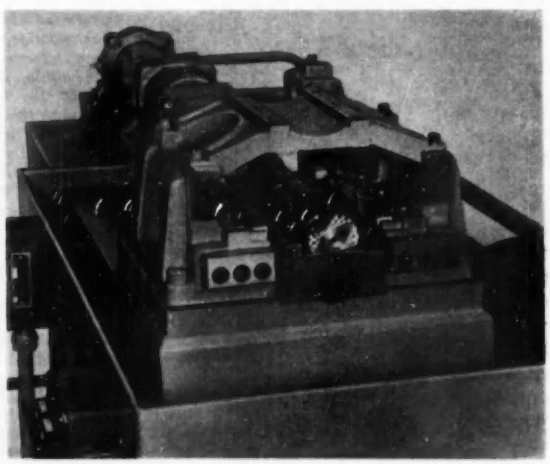
Circle 73 on page 89 for more data

Quick Change for Three Sizes

Locating faces on bearing caps are broached at the rate of 480 per hour with this special semi-automatic machine featuring two adjustable stationary insert-type broaches.

Model HB1 has a 12-in. broaching stroke traveling at the rate of 30 fpm. Maximum return speed is 60 fpm. The fixture guides the bearing cap as it is pushed past the stationary broaching teeth by the ram. Three caps of different sizes are machined on the HB1 while using the same fixture. Two of the caps are broached with the fixture located as shown. By removing four holddown bolts, the fixture is inverted, and in this position performs its guiding function for the bearing cap with the greatest thickness. *Colonial Broach Co.*

Circle 74 on page 89 for more data



Special broach, Colonial HB1, for bearing cap faces.

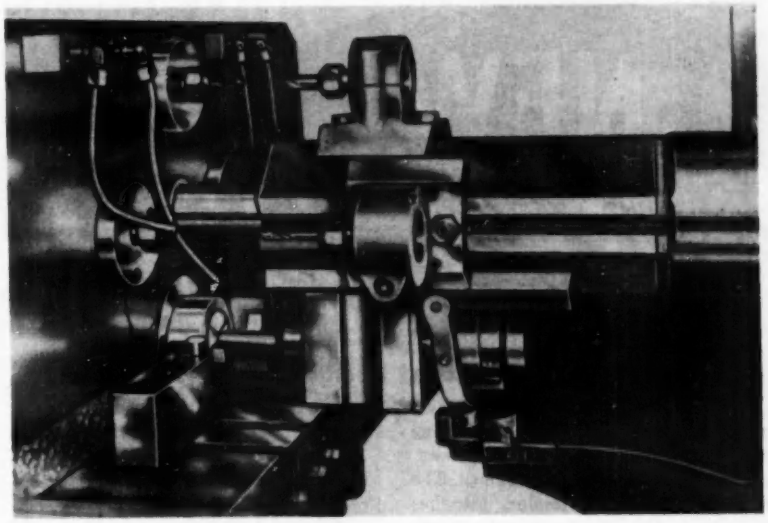
Pressure Tape

A recently developed pressure-sensitive tape, Temp-R-Tape T, having a base of du Pont Teflon tetrafluoroethylene resin, provides a new and simple means for putting the resin's unique properties to work in a wide variety of applications. The extreme chemical resistance of Teflon and the wide range of temperatures over which it maintains its properties indicate that the tape will be used for sealing high-temperature ducts and chemical ducts. The manufacturer indicates that the tape, using a silicone polymer adhesive, is completely effective over the temperature range of —80 F to 400 F.

Additional uses for the tape are as a facing material, providing a non-sticking surface for packaging machinery, and as an electrical insulating tape.

Temp-R-Tape T adheres readily to a variety of surfaces including glass, aluminum, steel, phenolics, copper, and brass. It is being manufactured in widths varying from ½ to 12 in. *Connecticut Hard Rubber Co.*

Circle 75 on page 89 for more data



Machines After Cutoff

A Double-Matic screw machine processes both the front and back of work pieces in one complete cycle, performing additional work after cut-off. A tool-holding turret revolves on an axis parallel to the spindle. The final turret position is occupied by a live spindle which contains a collet and runs at the same speed as the main drive spindle. This live spindle grips the work piece, supports it during cut-off and continues to hold it. Then, while turret tools machine the next piece, the back end is machined by tools mounted on the headstock. Almost any operation—drilling, reaming, tapping, threading, forming or chamfering—can be performed as easily on the back end as on the front. (Porter-McLeod Machine Tool Co., Inc.)

Circle 76 on page 89 for more data

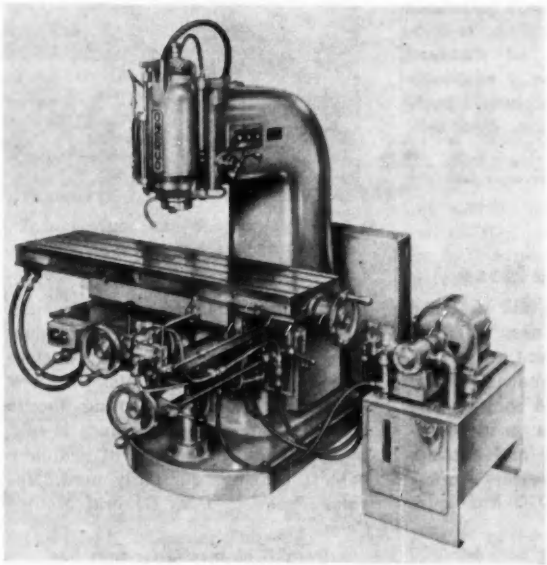
Non-Fe Mill

A low-priced medium-sized hydraulic-powered unit for high speed milling of non-ferrous metals, the A-245 is claimed to increase normal milling speed of all sizes and shapes of parts from 100 to 600 per cent.

Among the engineering features are: centrally located simplified hydraulic feed controls; the fact that manual control can take over at any time without stopping the hydraulic system; the directional, knee, cross and table feed controls with five forward and reverse positions including rapid traverse; table speeds from zero to 150 ipm.

The 7½-15 hp, 3600/7200 rpm spindle motor is raised or lowered by air and manually operated for close adjustment. Capacity is 19¾ in. less cutter width; length 28 in. Table size is 14 by 26 in., travel 28 in.; cross slide travel 14 in., knee travel 10 in. Lubrication is mist feed on motor; Bijur pressure feed on table and cross slide; pressure grease on balance of slides and bearings; coolant mist feed on the cutter. *Onsrud Machine Works, Inc.*

Circle 77 on page 89 for more data



The Onsrud A-245 milling machine for non-ferrous metals, plastic and wood.

Improved Tow

New features to provide greater driving safety, comfort and simplicity have been incorporated in the redesigned "Clarkette 5" line of general utility towing tractors, according to the manufacturer.

While basic dimensions of this 500-lb drawbar pull capacity machine have been retained, the driver platform has been lengthened and the brake pedal relocated to provide more room for the operator without affecting the turning radius and the intersecting aisle dimensions. The control lever has been altered to reduce hand fatigue and the center control linkage has been moved to a lower cross bar, so that the control handle is now obstruction free. The Continental N-62 engine has been equipped with revised piston rings and aluminum pistons. *Clark Equipment Co.*

Circle 78 on page 89 for more data

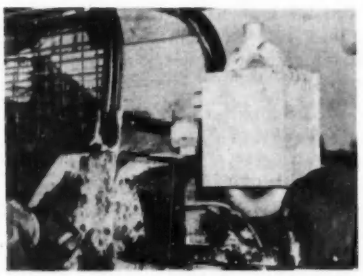
NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Catalytic Exhaust Purifier for Diesels

A catalytic muffler that effectively reduces the noxious and irritating components of four-cycle Diesel engine exhausts has been developed. The device, called the Dieseler, attaches directly to the engine exhaust manifold. It has permitted a standard Diesel-powered tractor-shovel to operate underground without danger from exhaust fumes. Prototype Dieselers in tests eliminated 65-85 per cent of irritating hydrocarbons, 80-90 per cent of carbon monoxide, when operating fairly steadily at 60 per cent or more of rated load. Each of eight standard sections contains 73 porcelain rods coated with alumina and platinum alloy. *Oxy-Catalyst, Inc.*

Circle 36 on page 89 for more data



Rubberized Copra Product for Cushions

Co-Ro-Tex, a latex treated cushioning material of exceptional resilience, toughness and durability was developed from coir, an allied product of the copra industry. Odorless, dust and lint-free, it is said to be used wherever curled hair, foam rubber, rubberized glass or rubberized tampico fibre may be used. It is available in flat sheets, 25-yd rolls, or die-cut to many shapes. It is produced in three densities in widths up to 72 in. and in thicknesses ranging from ½ to four in. *Columbian Rope Co.*

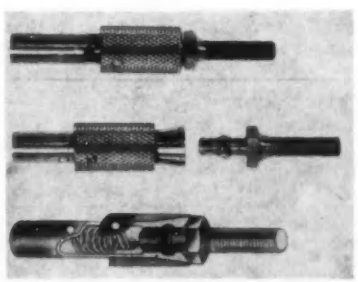
Circle 37 on page 89 for more data

Quick Disconnect for Vibrating Rods

A quick disconnect unit for rod or cable controls is designed to eliminate endplay and looseness. It features a chuck-like locking unit with sliding collet which has withstood exhaustive vibration tests.

Although only 3¼ in. long, the H. P. Quick Disconnect has been tested successfully for tensile and compression loads of approximately 2000 lb. Its stainless steel construction, as well as its performance features, meets all National Aircraft Standards Committee specifications. It is supplied from stock for all standard thread sizes, and is easily adaptable for any specially designed attachments for rod or cable use. *Hydraulic Products Co.*

Circle 38 on page 89 for more data



Vinyl Sheet

Boltaflex supported vinyl upholstery materials are now being produced for the automotive industry. They have a tough vinyl face sheet supported with a knitted jersey or woven fabric backing. They are available in leather-like finishes and fabric-like textures in standard or custom colors. *Bolta Products, Div. of General Tire & Rubber Co.*

Circle 39 on page 89 for more data

Multi-Purpose Hose

A new hose, Conductall, designed for general industrial use, will conduct air, oxygen, acetylene, water, oil, grease, gasoline, kerosene and many dilute chemical and acid solutions. It is recommended for use on air operated tools, for welding and cutting, and for all types of water service. *Republic Rubber Div., Lee Rubber & Tire Corp.*

Circle 40 on page 89 for more data

Al-Clad Bearing

An aluminum-clad steel bearing, called Moraine-400, now in production, has a layer of babbitt electroplated over the aluminum. A new alloy steel provides a strong ductile bond surface. Life expectancy is said to be several times that of ordinary babbitt bearings currently used. *Moraine Products Div., General Motors Corp.*

Circle 41 on page 89 for more data

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FREE LITERATURE

Aero Asbestos 1

Asbestos Products for Aircraft, Form 4920, describes products for coated asbestos fabrics for sealing aircraft engine firewalls; heat-resistant, non-absorbent tadpole tapes for sealing jet engine firewalls; heat and air transfer ducts; R/M packings made of Inconel for sealing exhaust system joints and adjustable jet nozzles; and asbestos tapes, cloths and tubing. *Raybestos-Manhattan, Inc.*

Disk Brakes 2

A booklet about disk brakes, written in non-technical language, describes the engineering and safety features of this type of brake. *Auto Specialties Mfg. Co.*

Magnetic Separators 3

Information on the construction and uses of magnetic separators for fast and easy handling of steel sheets and plates is included in a short bulletin recently published by *Basco Manufacturing Co.*

Copper Tube 4

Properties, applications and advantages of seamless and Weldrawn beryllium copper tubing are presented completely in Data Memorandum No. 7-2 offered by *Superior Tube Co.*

Type 4300 Steel 5

Bulletin NS-1, six pages, gives in 16 charts a digest of information on the composition, heat treatment, transformation characteristics and mechanical properties of the standard AISI and SAE nickel-chromium-molybdenum steels. *International Nickel Co.*

Welding Buffers 6

"Resistance Welding at Work," Vol. 3, No. 8, relates how standard resistance welders have been adapted to a multiple weld operation on automobile bumper guards. *Sciaky Bros., Inc.*

Shot and Grit 7

Properties and uses of the Blastrite line of abrasive materials, including chilled cast iron, Hi-alloy "B" cast iron and malleable shot and grit, as well as steel and cut steel wire shot are fully explained in Catalog AB-53. Included is a consumption chart, based upon experience under average conditions. *Abrasive Shot and Grit Co.*

Lift Trucks in Auto Plant 8

How 85 per cent of items handled at Hudson Motor Car Co. are palletized in unit loads is reported in Job Study No. 129. *Towmotor Corp.*

(*Please turn page*)

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Gaging Practices 9

A primer on modern plug and ring gaging is included in the latest 24-page catalog of *H. C. Clatfelter Co.*

Superfinish 10

The Superfinishing process has made tremendous strides in the past few years. A new catalog recording this progress includes a brief description of the process; complete specifications on the 12 machines and five attachments available for this work; plus information and photographs on 28 different job applications. Form 1169. *Gisholt Machine Co.*

Small Switches 11

Four-page catalog 74 gives complete information on 15 ultra-small type V3 precision snap-action switches and auxiliary actuators (postage stamp size), which are said to have the highest electrical rating, for the overall size, of any snap-action switch available. *Micro Switch Div. of Minneapolis-Honeywell Regulator Co.*

Industrial Plastics 12

Data on the manufacture, grades, properties, fabrication and use of laminated plastic sheets, tubes, rods, and special shapes is available in a 16-page bulletin. The company's special plan for plastic products development and production is covered in detail. Performance records of plastic bearings in industrial and marine service are included. *Joseph T. Ryerson & Son, Inc.*

Impact Testers 13

Sonntag pendulum-type impact machines with maximum capacities of 240 ft-lb and 48 ft-lb for metals and plastics respectively are described in a new four-page bulletin, No. 4211 from *Baldwin-Lima-Hamilton Corp.*

USE THIS POSTCARD

Gear Finishing 14

Surface junction blending, burr removing, and cleaning operations on gears with Brushamatics are outlined in an eight-page bulletin, R291-10M. *The Osborn Mfg. Co.*

Enclosed Motors 15

The Tri-Clad "55" line of enclosed motors in the one to 30-hp range are pictured and described in booklet GEA-6012. *General Electric Co.*

Oscillograph 16

A lucid description of the type 5-114 recording oscillograph, 18 or 26 channels, is given in bulletin CEC-1500C, 16 pages. *Consolidated Engineering Corp.*

Universal Mill 17

A vertical milling machine with a universal head is described in a flyer from *Duff Machine Co.*

Precision Bench Mill 18

Power feed and coolant system are optional features of a precision bench type milling machine with a complete set of accessories available. Four-page bulletin. *Elgin Tool Works, Inc.*

Air Cylinders 19

Heavy-duty (200 psi) air cylinders featuring interchangeable mounts, in sizes from 1½ to six-in. bore, are specified in a 12-page catalog. *Petch Mfg. Co.*

Protects Presses 20

A hydraulic overload pitman to protect punch presses and dies from overload damage is illustrated in flyer 205. *Dayton Rogers Mfg. Co.*

Silent Chains 21

An 88-page Silent Chain Book, containing detailed engineering data, is believed to be one of the most comprehensive books developed on this subject. Pre-engineered stock drives for normal requirements are listed in one 16-page section of Book 2425. Another section of 22 pages outlines the procedure for selecting completely engineered drives. It includes a conveniently indexed table of service factors, rating tables, and chain length and center distance computations. A section on drive components lists available chain widths; chain and wheel dimensions; wheel tolerances, materials, and other pertinent data. The section on accessories covers casings and tensioners. Complete operational and technical data, such as installation, maintenance, and lubrication procedures, are described in the final section. *Link-Belt Co.*

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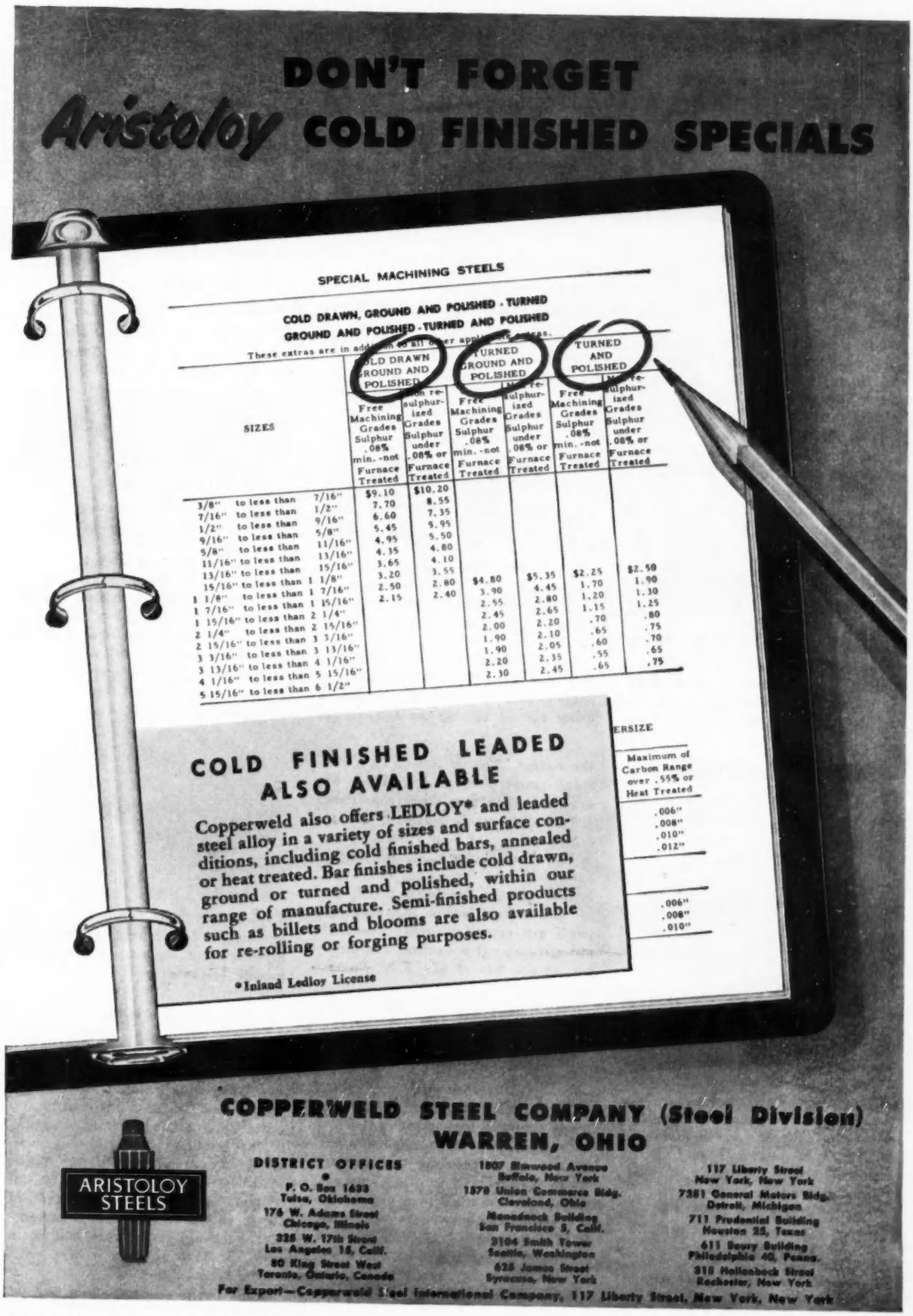

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1/2" to less than 9/16"	6.60	7.35				
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5/8" to less than 11/16"	4.95	5.50				
11/16" to less than 13/16"	4.35	4.80				
13/16" to less than 15/16"	3.65	4.10				
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1 1/8" to less than 1 7/16"	2.50	2.80	$4.80	$5.35	$2.25	$2.50
1 7/16" to less than 1 15/16"	2.15	2.40	3.90	4.45	1.70	1.90
1 15/16" to less than 2 1/4"			2.55	2.80	1.20	1.30
2 1/4" to less than 2 15/16"			2.45	2.65	1.15	1.25
2 15/16" to less than 3 3/16"			2.00	2.20	.70	.80
3 3/16" to less than 3 13/16"			1.90	2.10	.65	.75
3 13/16" to less than 4 1/16"			1.90	2.05	.60	.70
4 1/16" to less than 5 15/16"			2.20	2.35	.55	.65
5 15/16" to less than 6 1/2"			2.30	2.45	.65	.75

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*Inland Ledloy License

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625 James Street, Syracuse, New York
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717 Prudential Building, Houston 25, Texas
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318 Hollenbeck Street, Rochester, New York

For Export—Copperweld Steel International Company, 117 Liberty Street, New York, New York

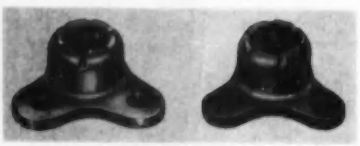
NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Lock Nut Lines Redesigned to Save Weight

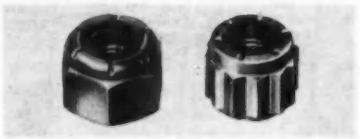
Lighter lock nuts, in four lines covering most aircraft requirements, are now in production. Weight saving is accomplished through new designs and lighter materials, and is of the order of ½ to 2½ lb per 100 nuts.

The Blue J line of aluminum lock nuts is designed to be inter-changeable with standard AN 365 steel nuts,



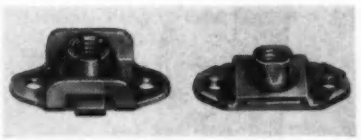
while 65 per cent lighter. The line includes hex nuts (right, contrasted to the heavier steel nut it replaces), floating anchor, anchor, and gang channel nuts in 14ST-6 and -7, 24ST-6 and 75ST in sizes through ¼-28. Blue dye identifies them from aluminum nuts of lower strength. Weight savings run up to one lb per 100.

The Type Y line of steel non-fixed nuts (right) in sizes 10-32 through ⅝-18, are 25 per cent lighter because



of the double-hex design, without sacrificing strength. Edge clearance can be reduced and bolts located closer together. Weight savings run to 1.9 lb per 100.

Type LH (right) is an all-metal anchor and gang-channel lock nut for temperatures up to 550 F. Instead of using slotted beams, the top of the threaded area is reduced at 90-deg intervals, displaced slightly. Threads below the locking area assume normal



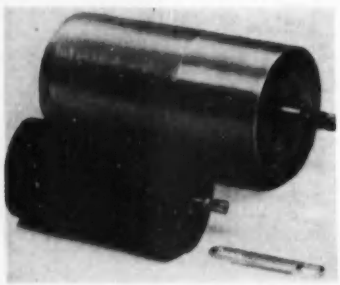
loading. Locking is elastic, radially. These weigh 45 per cent less than similar beam-type nuts.

A line of beam-type nuts, ZA1W, previously announced, is available in two types for 800 or 1200F service. The two-part nuts use a less costly material for the base, reserving the high-hot-strength alloy for the threaded part. Weight was reduced 30 per cent. *Elastic Stop Nut Corp.*

Circle 46 on page 89 for more data

Small Geared Motors

Two 400-cycle a-c geared motors are available. The background motor



measures three in. in length by 1¼ in. in diameter. It has an output torque to 80 in.-oz at speeds from one rpm. Foreground motor measures two in. in length by one in. in diameter, and has an output torque to 10 in.-oz at speeds from one rpm. *Mission-Western Engineers, Inc.*

Circle 47 on page 89 for more data

Lube Pump

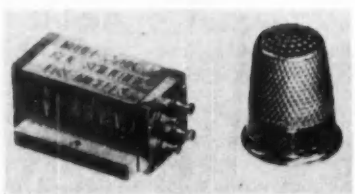
A package unit used on jet engine test cells pumps lubricating oil into the engine. The oil is held at a constant temperature and pressure the same as actual operating conditions.

The equipment consists of air operated valves, 20 gpm Yale & Towne pump, Cuno filter, heat exchanger, load cell and precision indicators, Parker fittings, explosion-proof motor and lockout button. All electrical parts are explosion-proof. Double-A air-operated valve controls the direction of the flow of oil. *J. N. Fauver Co.*

Circle 48 on page 89 for more data

Smallest Accelerometer

Par performance with only about half the weight and size of the formerly required component is the feature claimed for a so-called sub-subminiature accelerometer (strain wire type), said to be the world's smallest. With a maximum length of one in., the accelerometer weighs 14 grams. It offers a range of ±0.5 to 100g and accuracy of one per cent full scale. Natural frequency is 30 to 250 cps, with damping factor of 0.7 of critical.



Typical uses include acceleration measurements, flutter analysis, vibration investigations, impact research, guided missile telemetering. *General Scientific Corp.*

Circle 49 on page 89 for more data

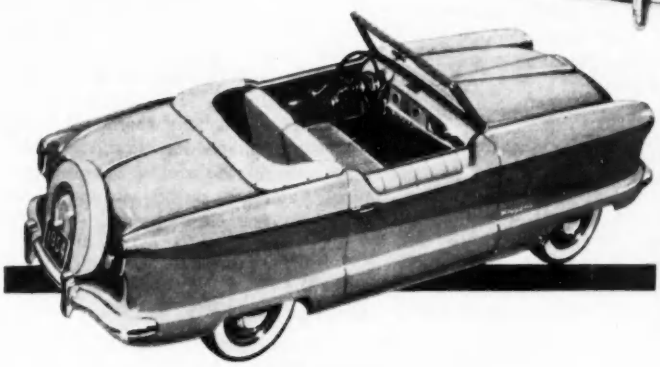
Magnetic Amplifier

A rugged magnetic amplifier has been developed for flight control systems using artificial "feel."

The amplifier affords a simple, reliable means of amplifying feeble electrical signals generated by the dynamic air pressure instrument of the servo system into electric currents strong enough to operate equipment directly or to energize relays. *Airborne Accessories Corp.*

Circle 50 on page 89 for more data

Nash



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THE STANDARD OF COMPARISON

Observations

By Joseph Geschelin

Hydraulics Progress

The recent Vickers conference on machine tool hydraulics emphasized the important role of industrial hydraulics systems. One of the major problems facing automotive users is the shortage of trained people capable of designing, trouble-shooting, and maintaining hydraulic systems and their associated plumbing and accessories. It is noteworthy that Vickers, Illinois Institute of Technology, and other organizations have training courses to this end. Also of interest is the fact that U of M is breaking ground for an extensive laboratory for fluids studies and will be in position to train hydraulics engineers for industry. An article devoted to the Production Machine Tool Hydraulics Forum, sponsored by Vickers, Inc., will appear in AUTOMOTIVE INDUSTRIES, June 15.

Special Vehicles

On a recent visit to Available Truck in Chicago, we were impressed with the success of this company in the field of creating and building extremely specialized motor vehicles, even on a one of a kind basis. Their latest product is a tractor type vehicle to be used as a work horse in spotting trailers at terminals and warehouses for the Jewel Tea chain. They think this vehicle would be equally useful in loading trailers onto "piggyback" freight cars.

Automation Techniques

Automation is sweeping the industry. Yet it is important to bear in mind that the basic principles of mechanization and automaticity have been with us for 25 to 30 years or more. Examples too numerous to mention have existed where an automatic machine was equipped with automatic loading and unloading to produce what we would call automation today. What the new concept has accomplished is to organize complete fabrication lines and entire departments into a fully automatic cycle. Basically, automation depends upon the same principles of cost economy that govern any manufacturing situation. It is a question whether a given setup will pay off. And the same principle applies whether the plant is large or small.

Machinery Exports

Exports of machine tools have declined seriously since the end of the war, according to the experts. Recently we listened to an account of a business trip through Japan by one of our friends. He mentioned that very little modern industrial capacity exists among the big producers in that country. He saw physical evidence of the effectiveness of air raids over Japan. His conclusion is that Japan should be a terrific source of business for American machine tool builders, provided this Pacific bastion remains in our orbit.

Shielded Machinery

At the recent annual meeting of NMTBA it was disclesed that military agencies are demanding electronic shielding of machine tools to prevent interference with radio, radar, and other electronic devices. This is a problem of major proportions. We suggest that the machine tool industry seek the help of automotive laboratories where a similar solution was found during the war years on military trucks and tanks.

Machinery Leasing

Leasing of almost everything from tools to trucks is now engaging the attention of the machine tool industry as well. Explorations are being made as to the practicability of leasing certain types of machines, particularly special automatic equipment. It might work out in the case of small organizations where a particular type of machine may be needed for a contract job or an emergency of short duration. Might be more economical than charging an expensive machine to a single job or contract, probably more economical than improvising.

Pure Water

There is always something new under the sun. According to the *Rohm & Haas Reporter*, Culligan, Inc., of Northbrook, Ill., has set up a system of franchised dealers to distribute deionized, mineral-free water. Here is an answer to cooling system problems, probably to many laboratory and industrial problems as well.

Frameless Construction

At the recent SAE Passenger Car Meeting in Detroit, Laurence Pomeroy mentioned that most foreign makes have frameless construction. This has been the subject of considerable discussion in industry circles here and subsequent comment from the floor intimated something tangible may come in the not too distant future. At present only Nash and Hudson have frameless design.

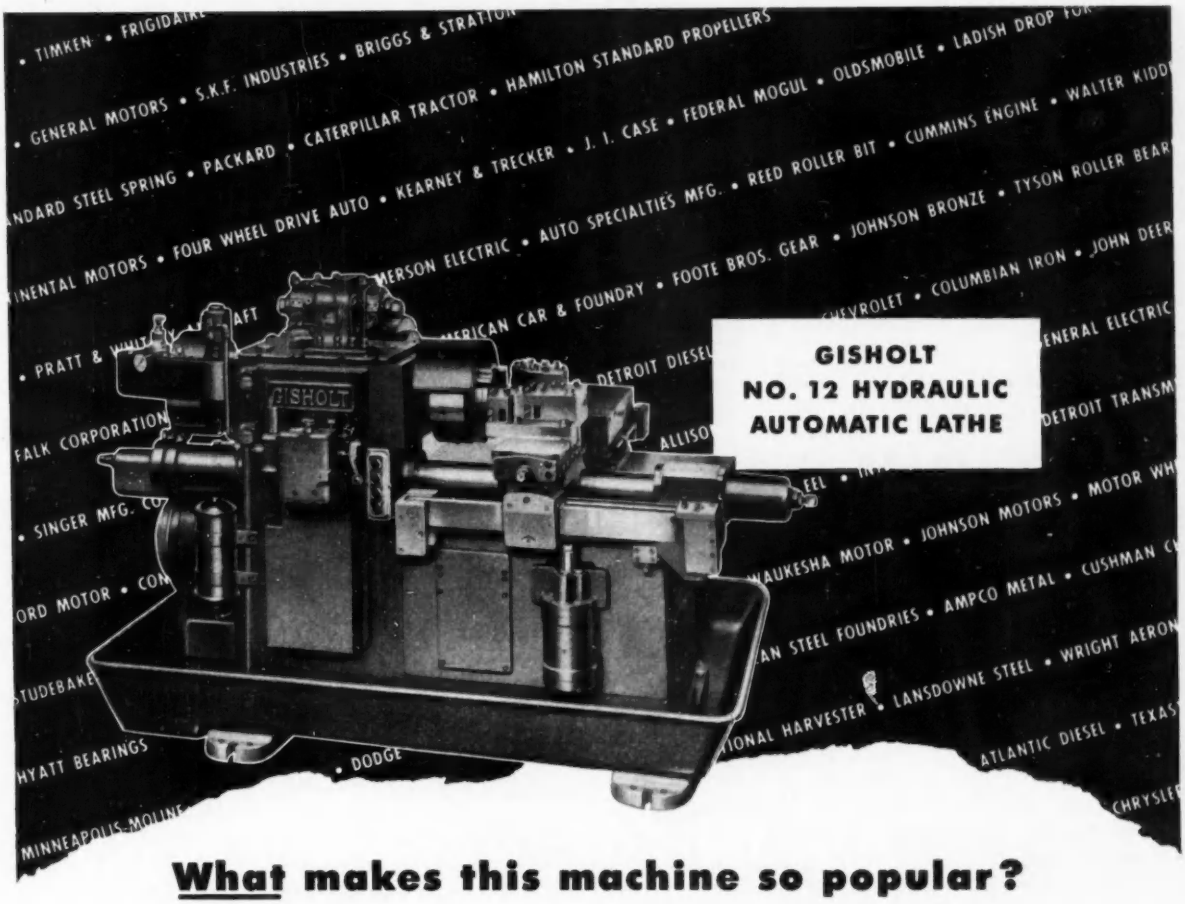
Export Design

In a prepared discussion at the SAE Passenger Car Meeting, Maurice Olley of Chevrolet touched on U.S. exports of passenger cars if and when free trade becomes established. He made a good point of the fact that when this time comes domestic producers must think in terms of small cars suited to foreign markets rather than trying to sell standard American cars. If we are to win and hold export markets, we shall have to give them the kind of transportation suited to their specific needs.

Forging Lubes

Apparently one of the major needs of the hot forging industry is some new type of die lubricant that will

(*Turn to page* 128, *please*)



What makes this machine so popular?

It's the simple basic application of hydraulic principles—perfected through the years. It's a single spindle machine that handles all classes of work—holding with a chuck or an arbor, with fixtures, or with a work driver for between centers. Front carriage alone will perform 14 different cycles. Independent rear slide can be positioned at any angle to the work. Feeds are infinitely adjustable...not limited by cams. Here's the versatility, the speed, the automatic cycle, and the easy change-over that mean big savings for scores of users. Why not for you?

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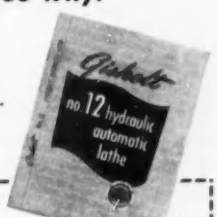
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

This new catalog will show you why.

All operating features are clearly described, fully illustrated. Here, too, are 28 different jobs to show many classes of work and tooling possibilities. Write for your copy.



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METALS

Not Much Increase in Steel Output Expected Before Third Quarter of Year. Steel Scrap Prices Up, Lead Remains Firm.

By William F. Boericke

Steel Operating Rate Unchanged

Leaders in the steel industry admit that the expected spring upturn in demand has not materialized. But they derive some satisfaction from the general stability of the basic price structure, in sharp contrast with previous experience in times of low demand. They believe that inventory reduction by their customers has nearly run its course and point out that the rate of incoming new orders although generally of limited tonnage, is increasing.

In short, it appears that new business is supporting the current operating rate which has held about 68 percent of ingot capacity for more than two months. In the first quarter the production rate averaged nearly 73 per cent but this in part was at the expense of order backlogs.

A little protective buying in May was credited to hedging on a possible steel strike that might follow breakdown in labor negotiations to take place in June. But the chances are remote for a steel strike in the opinion of the trade. With 16 per cent of steel workers idle and an estimated 20 per cent working less than 40 hours a week, conditions are obviously stacked against the union for expecting any sizable wage increase at this time. Best guess—a token hike in hourly rates and some increased fringe benefits that might add up to about 5-8 cents per hour.

Steel officials are not sanguine that an upturn will come before the third quarter. Summer is usually a dull period in the trade and if threat of a work stoppage is removed, buyers who now know they can obtain most steel products promptly from abundant stocks will continue their cautious purchasing policy. The present 68 per cent operating rate might rise to about 73 per cent when inventories are brought in line. That's as much as anyone wants to project for the next month or two.

Best Selling Steel Products

Not all steel products are slow. The record activity in the construction field has made structural shapes the strongest feature of the market. Unlike other steel products, demand has been so good that sellers have not been forced to absorb freight. Oil country goods are also moving relatively well and tin plate, with the canners' big season ahead, has been well taken. With farm equipment business reported better, galvanized products show an upturn.

Warehouse business is spotty. Current volume is reported off 40-50 per cent from last year. Competition is severe and freight absorption is general. Cold-finished bars have been in over supply. Competition of foreign steel at prices below domestic market has been noticeable, particularly on the west coast.

Base steel prices were slightly reduced in the Detroit area in May, but the action was not followed elsewhere. However, outside producers had to absorb freight to the extent of the cut. Demand for alloy steel, while slow by comparison with a year ago, showed some improvement in May. Railroad business was at a low ebb.

Scrap Prices Stronger

By the middle of May the *Iron Age* composite price of steel scrap had registered its eighth consecutive advance to $27.58 per ton, highest since February. While weekly increases had been small, they were regular. Historically regarded as a barometer of steel activity, the trade thinks that stronger scrap markets reflect a long overdue internal correction rather than a portent of better steel demand. Most scrap consumers are believed to have adequate stocks.

With low scrap price there has been less demand for pig iron from the steel makers and in consequence iron ore prices may soften. Increased foreign shipments of ore particularly from Venezuela insure adequate supplies. Signing of the bill to construct the St. Lawrence Seaway, of course, will bring in substantial imports from the Quebec-Labrador field over the longer term.

Government Refuses to Ease Stockpiling of Nickel

Big users of nickel as yet have not suffered from curtailment of supply but small consumers have been pinched. Their protests to Washington have received scant sympathy. The Government refuses to slow down stockpiling and in consequence there is less to go round to industry. Electro platers have been mainly hurt by diversion of nickel to meet the Government's objectives.

In spite of the present scarcity of nickel the long term outlook is for an increased supply. Considerable new production will be coming on the market from new mines in 1954-55 which may well prove in excess

(*Turn to page* 102, *please*)

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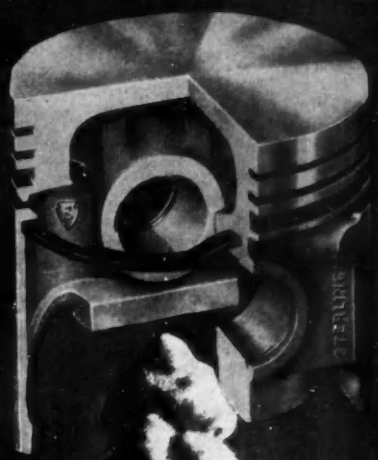

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STERLING ALUMINUM PRODUCTS, INC. • ST. LOUIS, MISSOURI

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

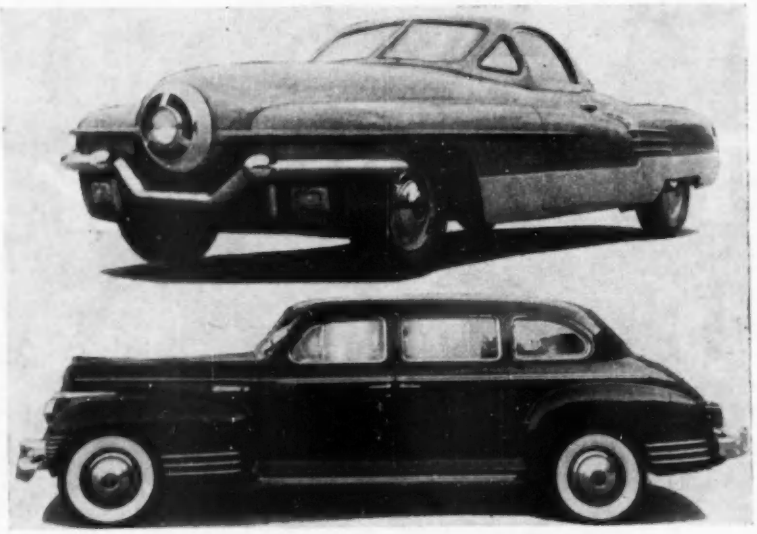
Continued from Page 39

Host of Products Viewed At Aviation Trade Show

Nearly 60 exhibitors assembled at the International Aviation Trade Show in New York last month to demonstrate a broad diversity of materials, products, and services for the aircraft industry. Displays included tools, hardware, air navigation aids, electrical devices, materials handling equipment, plastics, engines, packaging, etc.

Curtiss-Wright was on hand with its graphic display of aircraft engines now in production and under development, while Remington Rand demonstrated its new electronic computer systems. Bendix Aviation Corp. showed its line of aircraft brakes, fuel metering systems, landing gears, and ignition systems, and Buda Co. had on the floor representative models of its fork lift truck line and industrial towing tractors.

Plastics for aircraft applications came in for their due share of attention in the displays of Mastercraft Plastics Co., Mycalex Corp. of America and Scheidl Manufacturing Co. The widespread current interest in versatile plastic materials was spotlighted at a forum on "Metal and Plastics."



RUSSIAN SPORTSTER AND LIMOUSINE

In the top picture is shown a hardtop Russian sports car built on a ZIS-110 chassis. Engine of this two-seater is an eight-cyl. in-line unit of 366 cu in. piston displacement and rated at 140 bhp at 3600 rpm. Compression ratio is only 6.85 to 1, since high-octane gasoline is not generally available for automobiles in the USSR. At the bottom is Russia's largest passenger car, the eight-passenger ZIS-110 made in the Stalin Auto Plant in Moscow. Its 140-hp engine provides a top speed of 85 mph. Wheelbase is 150 in., overall length 240 in., and tread 64 in.

The formal program, held in conjunction with the show itself, also included a forum on jet and reciprocating engines and a motion picture demonstrating uses of the helicopter in the far North. Roy T. Hurley, president of Curtiss-Wright, was the first recipient of a plaque to be awarded annually by the show management to an aviation figure who has made an outstanding contribution to the field.

FIVE SECTIONS OF THE U. S. IN MARCH REGISTER GAINS OVER YEAR AGO

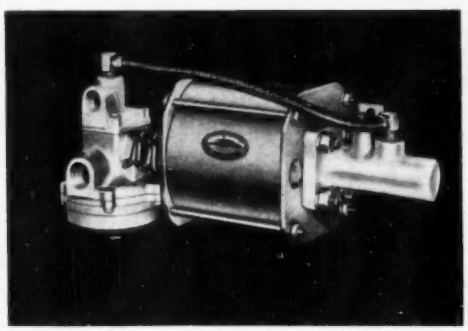
New Car Registrations by Regions

Zone	Region	March 1954	February 1954	March 1953	Three Months 1954	Three Months 1953	Per Cent Change: Mar. over February	Per Cent Change: Mar. over Mar. 1953	Per Cent Change: Three Months 1954 over 1953
1	New England	29,138	20,014	28,564	67,017	69,415	+45.59	+ 2.01	- 3.45
2	Middle Atlantic	83,935	73,144	94,066	228,090	234,924	+28.42	- .14	- 2.91
3	South Atlantic	51,535	44,546	57,334	141,563	149,972	+15.69	-10.11	- 5.61
4	East North Central	133,278	94,543	131,308	314,271	332,093	+40.97	+ 1.50	- 5.37
5	East South Central	24,369	19,238	22,988	60,653	62,453	+26.67	+ 6.01	- 2.88
6	West North Central	47,080	33,361	43,564	110,892	112,539	+41.12	+ 8.07	- 1.46
7	West South Central	45,300	36,610	41,064	118,144	124,561	+23.74	+10.26	- 5.15
8	Mountain	13,282	10,759	18,267	34,604	41,895	+23.45	-18.45	-17.40
9	Pacific	42,814	37,377	51,173	115,787	141,295	+14.55	-16.33	-19.76
	Total—United States	480,731	369,592	488,368	1,191,021	1,269,147	+30.07	- 1.16	- 6.16

States comprising the various regions are:—Zone 1; Conn., Me., Mass., N. H., R. I., Vt.—Zone 2; N. J., N. Y., Pa.—Zone 3; Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4; Ill., Ind., Mich., Ohio, Wis.—Zone 5; Ala., Ky., Miss., Tenn.—Zone 6; Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7; Ark., La., Okla., Tex.—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9; Cal., Ore., Wash.

Easy does it

with BORG-WARNER "FEATHER TOUCH" POWER BRAKES



Designed for Service Shop Installation on Most '46 to '54 Model Cars

By now, most car owners are aware of the many advantages of power brakes. Smooth, instant response to light pedal pressure . . . quicker, shorter, surer stops . . . less strain, less fatigue, greater driver comfort.

But up until recently, power brakes were available only as factory installed optional equipment on certain makes of new cars. Now—thanks to Borg-Warner engineering—B-W "Feather Touch" Power Brakes can be installed in an hour or so on most '46 to '54 models of all popular makes of cars.

As with scores of other Borg-Warner products, this new unit is engineered out of deep experience with the automotive industry's high standards. It has a minimum of wearing parts, requires no lubrication, is unaffected by changes in climate. And it is the industry's smallest, most compact unit, low in price, dependable in performance.

Designed and built by B-W's Marvel-Schebler Products Division, the new "Feather Touch" Power Brake is another example of Borg-Warner's "design it better—make it better" tradition. One more in a long list of B-W contributions to the driving safety, comfort and pleasure of the motoring public.

B-W *engineering makes it work* B-W *production makes it available*

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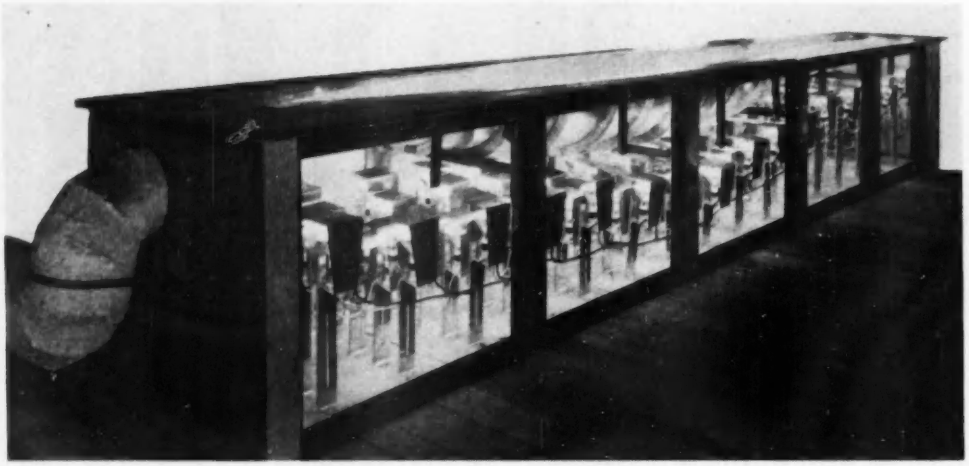
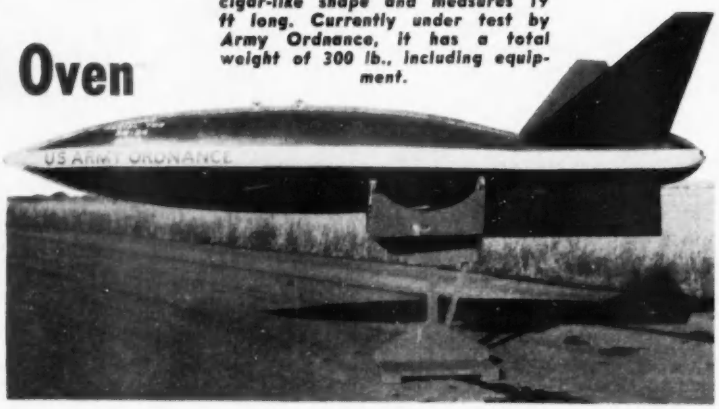
THESE UNITS FORM BORG-WARNER, *Executive Offices, Chicago:* ATKINS SAW • BORG & BECK • BORG-WARNER INTERNATIONAL • BORG-WARNER SERVICE PARTS • CALUMET STEEL • CLEVELAND COMMUTATOR • DETROIT GEAR • FRANKLIN STEEL • HYDRALINE PRODUCTS • INGERSOLL PRODUCTS • INGERSOLL STEEL • LONG MANUFACTURING • LONG MANUFACTURING CO., LTD. • MARBON • MARVEL-SCHEBLER PRODUCTS MECHANICS UNIVERSAL JOINT • MORSE CHAIN • MORSE CHAIN CO., LTD. • NORGE • PESCO PRODUCTS • REFLECTAL • ROCKFORD CLUTCH SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR • WARNER GEAR CO., LTD. • WOOSTER DIVISION



Shown here is the mold of 24ST sheet aluminum and 24ST reinforcing members for fuselage of target. The mold container and oven section are made up of steel angle and T. units. Note movable aluminum reflectors on infra-red lamps in oven section.

Mold With Integral Oven Used for Plastic Target



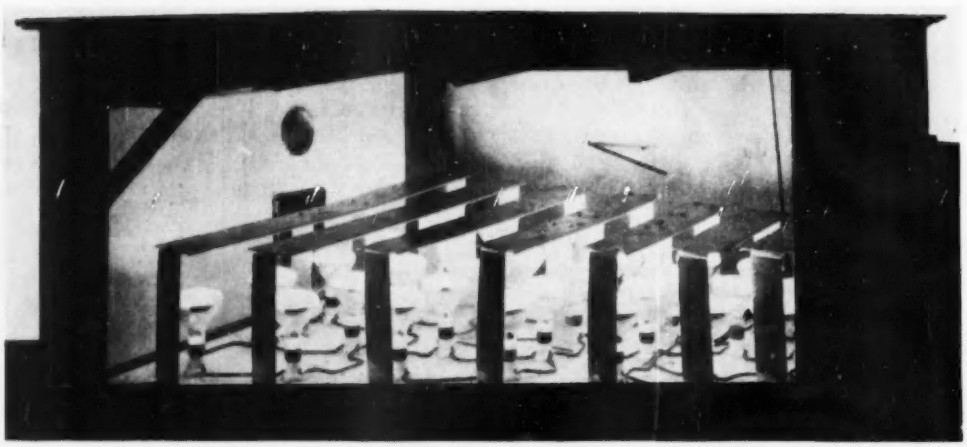
The Bellanca plastic target has a cigar-like shape and measures 19 ft long. Currently under test by Army Ordnance, it has a total weight of 300 lb., including equipment.

IN setting up production of its recently developed plastic air target (see AUTOMOTIVE INDUSTRIES, April 1, p. 39), Bellanca Aircraft Corp. added a unique twist to the familiar bag molding process in the form of an oven integral with each of the two molds for the shell and fins of the unit. The molds are of 24ST sheet aluminum and 24ST reinforcing members. The mold container and oven section are made up of steel angle and T units.

The infra-red lamps (see illustrations) of the oven have adjustable aluminum reflectors for proper heat distribution. A blower is incorporated for exhaust air and to keep warm air circulating in the oven.

The entire process for turning out the 19-ft long

(*Turn to page* 112, *please*)



Mold for fins of the target has the same type of integral oven as the fuselage mold on a smaller scale.

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METALS

(*Continued from page 96*)

of demand, according to the chairman of the International Nickel Co., world's largest nickel producer. Any move to raise the price of the metal should be resisted, he declared, as such increase would retard new development and affect adversely established trade relationships.

Good Copper Business Continues

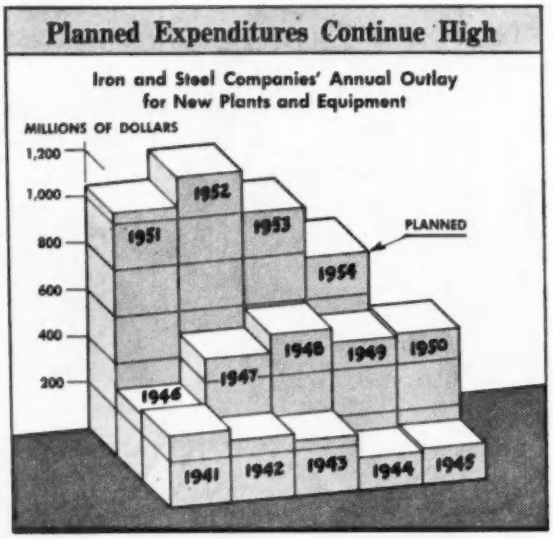
Several reasons are given for the excellent buying that has taken place in copper. No doubt some consumers are taking no chances on a strike that might follow breakdown of wage negotiations and are rebuilding inventories. Copper producers are cashing in on their foresight in curtailing mine production last February when demand was falling off and the 30 cent price looked shaky. At present production and consumption are in rough balance. With demand good from industrial consumers, the present price seems likely to hold for some time. July and August will be the critical months, when seasonal factors normally cause a slowdown for the Connecticut Valley fabricators.

April figures from the Copper Institute were good. Deliveries to fabricators totalled 104,800 tons, best month for the year to date. Refined stocks were little changed at the end of April from a month earlier, at the comfortable level of 124,500 tons, little more than five weeks' supply.

Best confirmation that business was satisfactory was the announcement by Kennecott Copper that it would recall 1200 men laid off at the mines, return to a six-day week, and restore half of the production cutback of two months back. By mid-August the country's largest producer will be turning out 5000 tons more copper.

Brass mills report that incoming orders have been the best in the year and wire mills are operating above normal rate. Custom smelters are sold out of copper. The Chilean situation still is in status quo but the big surplus has been whittled down to about 40-50,000 tons, after allowing for 100,000 tons which are earmarked for the national stockpile.

While the trade still expects to see copper sell below 30 cents per lb before the end of the year, pronounced bearishness has all but disappeared. More metal will be available in the third quarter. General Services Administration has established third quarter copper allotments for defense at 42,500 tons, down about 36 per cent from the 66,500 tons reserved for the second quarter. Industry will benefit by the reduction for the military.



An investment of $775,000,000 will be made during 1954 for new plant and equipment in the iron and steel industry, according to Steel Facts, published by American Iron and Steel Institute. With this outlay, the industry's postwar investment will increase to almost $6.4 billion. Over $1 billion was spent last year for steel expansion in this country.

Lead Demand Steady, Zinc Still Unsatisfactory

The lead market remains quietly firm at 14 cents per lb, with tolerably good demand here and abroad. Replacement battery shipments for the first quarter were higher than the same quarter in 1953 and 1952, with the big season for buying ahead. While requirements for original equipment will be lower, lead consumption may be more as new cars will be equipped with 12-volt batteries. An important new market for lead will be its use for nuclear shielding in shipping and handling containers for radioscopes.

April figures from the Zinc Institute gave scant cause to expect the zinc price to show much change unless Washington takes some action on tariff relief. Production of slab zinc was off slightly at 70,233 tons and shipments were up to 70,525 tons of which 2489 tons went into Government account.

However, for the first time since June, 1953, shipments exceeded smelter output, even if by a small margin.

Stocks of slab zinc in the hands of smelters failed to show any appreciable reduction and remained above the 200,000-ton level as April ended. Unfilled orders declined 5500 tons to 31,700 tons. The figures all add up to the conclusion that zinc still is a sick industry, and it's quite probable that the Tariff Commission will recommend a boost. Admittedly, the Administration is against tariff increases, but something more than stockpiling will be needed to satisfy the strong political pressure that will be brought to bear.

The best that can be said is that zinc stocks are in strong hands and there is little likelihood of distress selling at present prices that would show large inventory losses.

Judging Starts June 14 In Model Car Competition

Judging of winners in the 1954 Fisher Body Craftsman's Guild model car competition, which is expected to draw a record number of entries this year, will begin on June 14 in Detroit. Selection of winning models will be based on design, workmanship, originality and practicality.

This year's event should be of special interest, since, for the first time in the history of Guild, young designers are offered the opportunity to build sports cars, hardtops, convertibles or station wagons as well as two- or four-door sedans.

Fourteen winners selected from each state and the District of Columbia will be matched against other state winners for 40 regional awards. To date, the Guild has awarded 123 university scholarships worth more than $40,000 and over $600,000.

For maximum performance specify BCA ANGULAR CONTACT BEARINGS

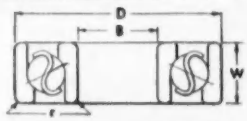
These bearings feature a sturdy one-piece, S-section retainer. There is no rivet to work loose, and the design of the retainer permits bearing construction that is fully angular-contact on both outer and inner rings. Low, medium, and high angles of contact are available in both light and medium series bearings.

BCA Angular-Contact Bearings have the ability to carry any combination of radial loads plus thrust loads in a given direction.

BCA engineering cooperation and design assistance are available to help solve your problems involving ball bearings.

The BCA Engineering Handbook is valued by engineers as an important addition to their technical library. Available to chief engineers without charge. Write on your official stationery.

DIMENSIONS AND IDENTIFICATION



Single Row—Light

Bearing Numbers Contact Angle			Bore B		Outside Diameter D		Width W		Fillet Radius* r	Balls	
Medium	Low	High	Mm.	Inches	Mm.	Inches	Mm.	Inches	Inches	No.	Size
7204-A	7204-N	7204-T	20	0.7874	47	1.8504	14	0.5512	0.040	12	1/4
7205-A	7205-N	7205-T	25	0.9843	52	2.0472	15	0.5906	0.040	11	9/32
7206-A†	7206-N†	7206-T†	30	1.1811	62	2.4409	16	0.6299	0.040	11	11/32
7207-A	7207-N	7207-T	35	1.3780	72	2.8346	17	0.6693	0.040	12	11/32
7208-A	7208-N	7208-T	40	1.5748	80	3.1496	18	0.7087	0.040	13	11/32
7209-A	7209-N	7209-T	45	1.7717	85	3.3465	19	0.7480	0.040	14	11/32
7210-A	7210-N	7210-T	50	1.9685	90	3.5433	20	0.7874	0.040	15	11/32
7211-A	7211-N	7211-T	55	2.1654	100	3.9370	21	0.8268	0.060	12	13/32
7212-A	7212-N	7212-T	60	2.3622	110	4.3307	22	0.8661	0.060	13	13/32
7213-A	7213-N	7213-T	65	2.5591	120	4.7244	23	0.9055	0.060	14	13/32
7214-A	7214-N	7214-T	70	2.7559	125	4.9213	24	0.9449	0.060	16	13/32
7215-A	7215-N	7215-T	75	2.9528	130	5.1181	25	0.9843	0.060	17	13/32
7216-A	7216-N	7216-T	80	3.1496	140	5.5118	26	1.0236	0.080	16	3/8
7217-A†	7217-N†	7217-T†	85	3.3465	150	5.9055	28	1.1024	0.080	15	15/32
7218-A	7218-N	7218-T	90	3.5433	160	6.2992	30	1.1811	0.080	15	3/8
7219-A	7219-N	7219-T	95	3.7402	170	6.6929	32	1.2598	0.080	15	15/32
7220-A	7220-N	7220-T	100	3.9370	180	7.0866	34	1.3386	0.080	15	1/2
7221-A	7221-N	7221-T	105	4.1339	190	7.4803	36	1.4173	0.080	15	1 1/16
7222-A	7222-N	7222-T	110	4.3307	200	7.8740	38	1.4961	0.080	15	1 1/16
7224-A	7224-N	7224-T	120	4.7244	215	8.4646	40	1.5748	0.080	15	1 1/16
7226-A	7226-N	7226-T	130	5.1181	230	9.0551	40	1.5748	0.100	16	1 1/4
7228-A	7228-N	7228-T	140	5.5118	250	9.8425	42	1.6535	0.100	16	1 5/16

Single Row—Medium

Bearing Numbers Contact Angle			Bore B		Outside Diameter D		Width W		Fillet Radius* r	Balls	
Medium	Low	High	Mm.	Inches	Mm.	Inches	Mm.	Inches	Inches	No.	Size
7303-A	7303-N	7303-T	17	0.6693	47	1.8504	14	0.5512	0.040	12	1/4
7304-A	7304-N	7304-T	20	0.7874	52	2.0472	15	0.5906	0.040	10	9/32
7305-A†	7305-N†	7305-T†	25	0.9843	62	2.4409	17	0.6693	0.040	10	11/32
7306-A	7306-N	7306-T	30	1.1811	72	2.8346	19	0.7480	0.040	10	13/32
7307-A	7307-N	7307-T	35	1.3780	80	3.1496	21	0.8268	0.060	10	15/32
7308-A	7308-N	7308-T	40	1.5748	90	3.5433	23	0.9055	0.060	10	15/32
7309-A	7309-N	7309-T	45	1.7717	100	3.9370	25	0.9843	0.060	11	15/32
7310-A	7310-N	7310-T	50	1.9685	110	4.3307	27	1.0630	0.080	12	15/32
7311-A†	7311-N†	7311-T†	55	2.1654	120	4.7244	29	1.1417	0.080	12	15/32
7312-A†	7312-N†	7312-T†	60	2.3622	130	5.1181	31	1.2205	0.080	12	7/16
7313-A†	7313-N†	7313-T†	65	2.5591	140	5.5118	33	1.2992	0.080	12	15/32
7314-A	7314-N	7314-T	70	2.7559	150	5.9055	35	1.3780	0.080	12	1/2
7315-A†	7315-N†	7315-T†	75	2.9528	160	6.2992	37	1.4567	0.080	12	1 1/16
7316-A†	7316-N†	7316-T†	80	3.1496	170	6.6929	39	1.5354	0.080	12	1 1/16
7317-A†	7317-N†	7317-T†	85	3.3465	180	7.0866	41	1.6142	0.100	12	1 21/32
7318-A†	7318-N†	7318-T†	90	3.5433	190	7.4803	43	1.6929	0.100	12	1 1/16
7319-A†	7319-N†	7319-T†	95	3.7402	200	7.8740	45	1.7717	0.100	12	1 1/16
7320-A†	7320-N†	7320-T†	100	3.9370	215	8.4646	47	1.8504	0.100	12	1 21/32
7321-A†	7321-N†	7321-T†	105	4.1339	225	8.8583	49	1.9291	0.100	12	1 1/16
7322-A†	7322-N†	7322-T†	110	4.3307	240	9.4488	50	1.9685	0.100	12	1 7/8

* Bearing corner radii will clear maximum fillet radius shown.
† For use of these sizes consult BCA Engineering Department.

BCA *radial, thrust, angular-contact Ball Bearings*

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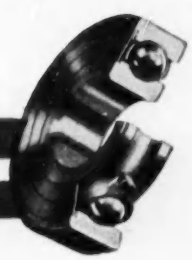


Basic Production Methods for Aluminum Pistons

(*Continued from page* 69)

To obtain the greatest economy in machining aluminum alloys, machine speeds must be high in comparison with speeds for other kinds of metals. Machine tools must be rigid and free from vibration to assure close tolerances and good surface finish. Aluminum pistons are normally supplied to the engine manufacturer in rough machined form, and it is important that finish machining be located from the same spots as for rough machining to obtain uniformity of piston sections. Chucks and fixtures for holding the piston during machining should be quick acting and positive but so designed as not to cause distortion.

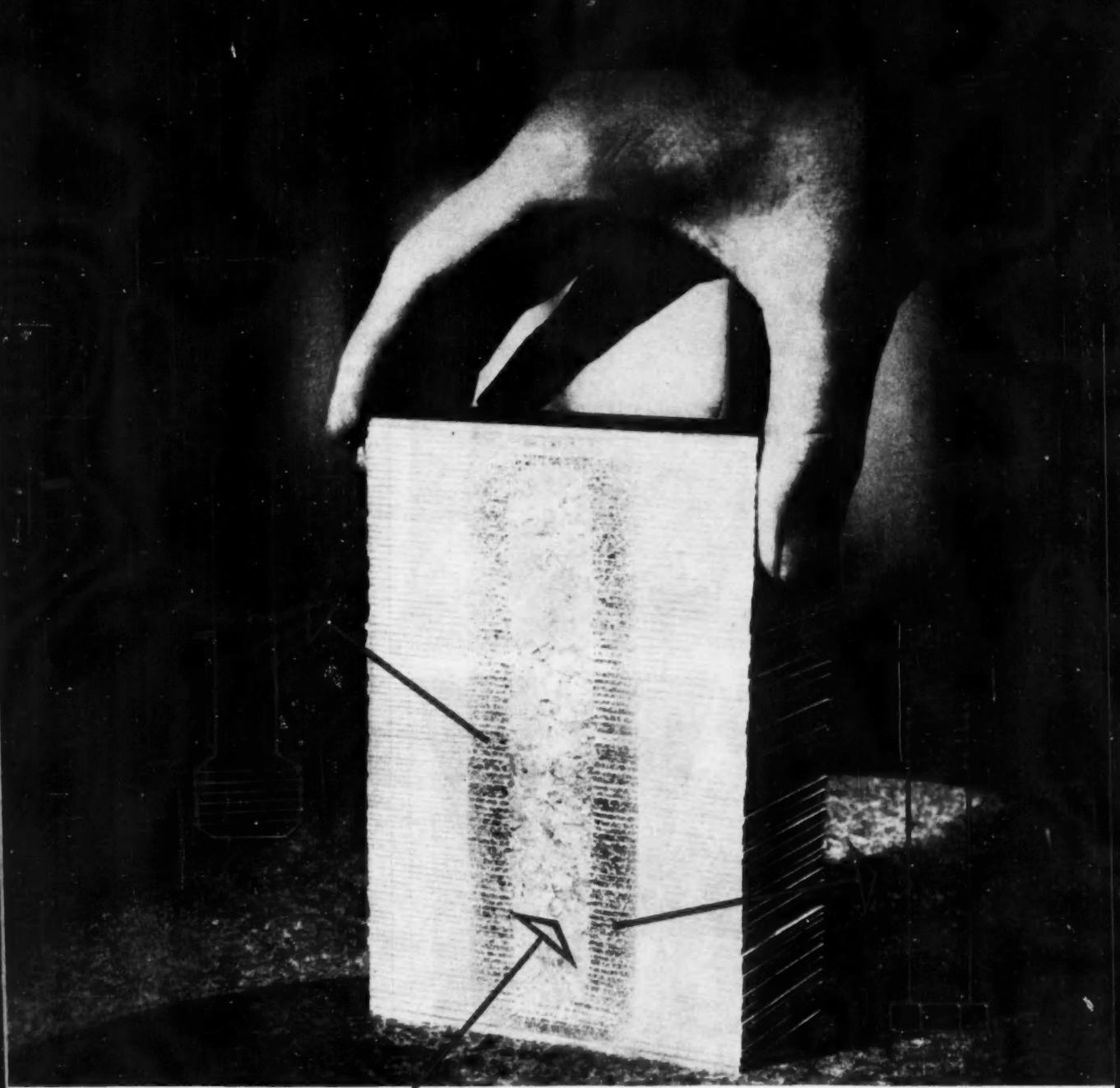
Tools properly ground for the machining of aluminum alloys will have considerably more top and side rake than those used for the machining of steel. Carbide-tipped tools are used for long production life when machining the higher silicon content aluminum piston alloy, the cutting edges being diamond-lapped or honed to reduce the coefficient of friction between the tool and the work. The following ranges are recommended for the contour angles of tools used for machining prior to grinding the skirt or ring grooving: cutting angle, 62 deg to 80 deg; top rake, 20 deg to 0 deg; front clearance, 8 deg to 10 deg; side rake, 6 deg to 10 deg; side clearance, 6 deg to 10 deg. Cutting speeds approaching 1000 fpm, cuts in the range of 0.015 to 0.030 in., and feeds up to 0.008 in. per revolution are quite practical when machining the outside surfaces of an aluminum piston in one pass prior to grinding.

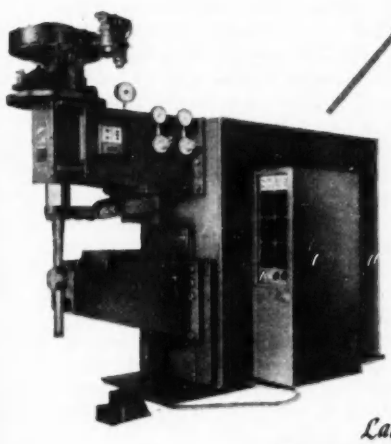
A gang-tool roughing cut followed by a finish cut is good general practice when machining ring grooves. For the finish machining of ring grooves approximately 0.010 in. finish stock is allowed on either side of the groove. Cutting speeds from 200 to 275 fpm and feeds of 0.004 to 0.006 in. per revolution are good practice. Finish grooving tools are usually ground with 0 deg top rake and 1 deg to 2 deg side clearance angle. They must be accurately ground and polished for best results.

At these high cutting speeds, a generous supply of coolant directed to the tool tip will increase tool life and assure adherence to close dimensional tolerances. A suitable lubricant or coolant should have low viscosity to permit chips to settle before recycling, resistance to oxidation, and no harmful effects on the work, tools, or operator. Many commercial lubricants and coolants meet these specifications adequately.

From 0.006 to 0.012 in. stock allowance should be provided for grinding to a cam contour. The grinding wheel is generally of the silicon carbide type with a relatively soft bond. Peripheral speed of the grinding wheel is usually from 6000 to 7000 fpm and that of the piston is approximately 150 fpm. Surface finish specifications on piston skirts range from 30 to 60 micro-inches (rms).

A recent innovation in the production of contoured pistons is the development of machine tools which will turn an elliptical contour on the piston skirt and also rough and finish bore the piston pin holes. The elliptical contour is achieved by placing the axis of the cutting tool at a slight angle to the axis of the piston in the plane of the piston pin centerline, allowing the piston to remain stationary while the tool is fed over it.





Spotwelding of Scrap Sheet Titanium Forms Solid Ingots for Machined Parts

A six inch pile of 85 laminations of .064 titanium with two laminations at each end of .091 titanium is joined with one weld on a Sciaky type PMCO 6ST 400 KVA Three-Phase Spot Welder. The weld nugget forms a solid ingot of virgin metal at least as strong as the parent metal. This ingot can be machined into a variety of titanium parts. Months of lead time required for titanium is avoided and expensive scrap is utilized.

Developed by the Manufacturing Research and Development Unit of the Glenn L. Martin Company, this technique offers another fine example of Sciaky basic thinking in design of resistance welding equipment to do *more useful work* at *lowest operating cost* with *maximum reliability*.

Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

4925 West 67th Street, Chicago 38, Illinois

Turin Show

(*Continued from page* 65)

pinions. The finned cylinders are of cast iron, but the crankcase, transmission housing, cylinder heads and turbine housing are of light alloy. Cooling is effected by a turbine drawing air around the cylinders and discharging it at the base. Output is 11 hp from this 26 cu in. engine. Rear springing is by a transverse torsion bar, while at the front support arms and coil springs provide independent suspension. Steering is rack and pinion type. This layout lends itself to cheap production, for the engine and transmission unit at the rear, and suspension and steering assembly at the front, are simply bolted to the all-steel body. For the sake of rigidity the forward hood is fixed, access to the compartment being obtained from under the cowl. With full electrical equipment, starter, windshield wiper, hydraulic brakes, etc., total weight is 880 lb. Plans are being laid to put this car into big production on European markets.

Osca, produced by the Maserati Brothers, presented a new sports model, intended for the American market, with a four cylinder, overhead camshaft engine of 3.07 by 3.07 in., giving a piston displacement of 91½ cu in. The engine has a compression ratio of 9.5 to 1 and is claimed to develop 120 hp at 6300 rpm. With a two-passenger sports body, weight is 1220 lb.

Geographical conditions favor the development of bus services for long distance touring. Alfa Romeo showed a special rear-engined vehicle of this type with a girder chassis frame produced by Cantieri Riuniti dell'Adriatico. This coach chassis was powered by the Alfa Romeo six cylinder Diesel of 579 cu in. piston displacement, mounted transversely at the rear on a downswept frame, with the drive carried forward to a double reduction rear axle. A 46 passenger body was fitted.

Lancia produced an underfloor, six-cylinder Diesel coach chassis, but instead of having a central location the engine was mounted in the forward position, flat under the floor boards, with the injectors on the top and available for examination on lifting out the floorboards. From this point the layout was conventional, with eight speed transmission, two-piece drive shaft, double reduction rear axle and air brakes.

(*Turn to page* 109, *please*)

DU PONT

PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

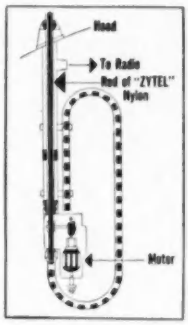
NEWS

NO. 3 — 1954

Bearings of Du Pont "Teflon" Offer Low Coefficient of Friction, Are Self-Lubricating

Only Du Pont "Zytel" nylon could solve this antenna design problem

Illustrated below is an unusual design for a motor-driven automobile antenna. When the antenna is *down*, the rod of "Zytel" stays coiled in the position shown by the dotted red line. When the driver pushes a button, a worm gear turns two gears



Rod and gears in this antenna are made of Du Pont "Zytel" nylon. Dotted line shows coiled position of rod when automobile antenna is down.

made of "Zytel" nylon, which then turn spring-loaded pulleys. These pulleys drive the rod into the position shown by the solid red line, thus forcing the antenna *up*.

Gears of "Zytel" nylon are used because of their quiet operation and wear resistance. They give trouble-free service for *the life of the car*.

The rod is made of "Zytel" because it is tough and strong, yet flexes safely to a four-inch radius.

Du Pont "Zytel" nylon is useful in a variety of automotive applications, which utilize the properties of this unique material in many ways.

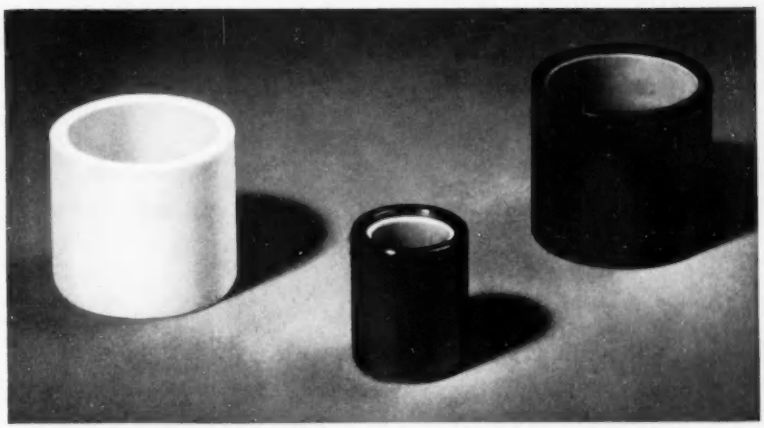
Investigate this versatile Du Pont engineering material further.

"Zytel" is the new trade-mark for Du Pont nylon resin.

"Teflon" suggests new solutions for bearing design problems

By DR. W. B. HAPPOLDT, JR., *Development & Service Section, Polychemicals Department, E. I. duPont deNemours & Co. (Inc.)*

In the automotive field, an engineering resin material with unusual properties promises new solutions for bearing design problems. It is Du Pont "Teflon" tetrafluoroethylene resin. Its advantages are many.



Bearings of Du Pont "Teflon" feature self-lubrication, low coefficient of friction.

First, "Teflon" for bearings offers a low coefficient of friction — lower than that of any other resin material. This low coefficient is constant through load changes, and is unaffected by temperatures up to 500° F.

What's more, a bearing of "Teflon" is self-lubricating. When in use, the bearing actually coats the revolving shaft with a thin film of "Teflon". Thus, any friction is that of "Teflon" against "Teflon" — which is no more than that of ice against ice. Because of this self-lubricating property of "Teflon" the shaft does not necessarily have to be mirror-finished, although finishes on the order of RMS-15 are recommended.

With all this, the mechanical strength of "Teflon" is high over a wide range of temperatures. It is tough and flexible, even at temperatures as low as —450° F., and is capable of continuous service at 500° F. It has good impact strength under normal conditions of speed and load. But the advantages of "Teflon" do not stop here.

Its abrasion resistance is excellent. In one laboratory, for instance, bearings of "Teflon" were still in satisfactory condition, after 1,000 hours' operation with 20 p.s.i. projected area load at 1500 r.p.m. Here is a useful quality of "Teflon" in bearing applications. Foreign particles imbed themselves in the bearings of "Teflon", and do not score the shaft.

Then, too, "Teflon" is in-

OVER

DU PONT

PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

NEWS

NO. 3 — 1954

Du Pont "Lucite" adds bright touch to advanced auto styling

For quality and beauty, think of Du Pont "Lucite" for advanced auto designing. It is pleasing to the eye, warm to the touch, strong, durable, and easy to form.

Molded "Lucite" acrylic resin is well known for its clarity, its resistance to weathering, its ability to "pipe" light around sharp angles and curves.

Knobs, medallions, and hub cap emblems of "Lucite" in various colors are familiar automobile applications. The data below can help you determine new and different uses for Du Pont "Lucite".

MECHANICAL PROPERTIES. Tensile strength at 73°F.: 9,000 p.s.i.; at 173°F.: 4,300 p.s.i. Modulus of elasticity at 77°F.: 400,000 p.s.i. Shear strength: 9,000 p.s.i.

THERMAL PROPERTIES. Coefficient of linear thermal expansion per °F.: 5 x 10^{-5}. Thermal conductivity, B.T.U./hr./sq. ft./°F./in.: 1.4.

ELECTRICAL PROPERTIES. Dielectric strength, short-time, v/mil.: 400; Dielectric constant, 60 cycles: 3.9; 10^6 cycles: 2.9. Power factor, 60 cycles: 0.042; 10^6 cycles: 0.025. Properties not materially affected by moisture, aging or weathering.

OPTICAL PROPERTIES. "Lucite" transmits up to 92% of incident light. Refractive index: 1.49. Clarity unimpaired by aging or weather.

CHEMICAL PROPERTIES. Dilute solutions of alkalies or strong acids (like battery acids) do not attack "Lucite." Neither do aliphatic hydrocarbons, dilute alcohols, nor petroleum oils.

WEATHERING PROPERTIES. "Lucite" does not craze or lose transparency after long outdoor exposure. Colorless "Lucite" is unaffected by sunlight.

MISCELLANEOUS PROPERTIES. Specific gravity: 1.18. Moisture resistance: excellent. Strength and toughness little affected by water vapor or water immersion. "Lucite" will burn slowly, but is difficult to ignite. "Lucite" is easy to work, can be readily joined by heat-welding or cementing.

Investigate Du Pont engineering materials in your product development programs

One of the family of these versatile engineering materials is often a key factor in product improvement or new product design.

The wide range of properties available with "Alathon"* polyethylene resin, "Lucite"* acrylic resin, "Teflon"* tetrafluoroethylene resin, and "Zytel"* nylon resin are helping solve industrial design problems.

NEED MORE INFORMATION?

Clip the coupon for additional data on the properties and applications of these Du Pont engineering materials.

Bearings of "Teflon"

(continued)

ert to practically all chemicals and solvents. Its water absorption is zero by ASTM test D570-42. It will not shrink, swell, crack or harden.

If you have a bearing design problem, consider these many advantages of "Teflon". It may help you cut costs, boost production, or increase the efficiency of your equipment.

For further information and test data, fill out and mail the coupon below.

E. I. DU PONT DE NEMOURS & CO. (INC.)
Polychemicals Department
Room 176, Du Pont Building, Wilmington 98, Delaware

Please send me more information on the Du Pont engineering materials checked: ☐ *"Zytel" nylon;* ☐ *"Alathon";* ☐ *"Teflon";* ☐ *"Lucite". I am interested in evaluating these materials for*

NAME _____ TITLE _____

COMPANY _____

STREET ADDRESS _____

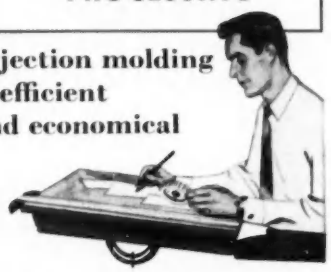
CITY _____ STATE _____

TYPE OF BUSINESS _____

*"Zytel", "Alathon", "Lucite", "Teflon" are trade-marks of E. I. du Pont de Nemours & Co. (Inc.)

POINTERS ON PROCESSING

Injection molding is efficient and economical



Injection molding, as a method of mass-producing parts made of Du Pont engineering resin materials, has been developed mainly within the past ten or fifteen years. And new improved techniques have accompanied that development.

Injection molding offers the advantages of high production rates, low unit cost, and usually does away with finishing operations. One important saving which has been effected by injection molding occurs when the molded piece replaces an assembly of two, three or more parts.

HIGH PRODUCTION RATE. Multi-cavity dies have been made which produce hundreds of identical pieces at a time. Molding time and cycle vary, of course, with the size of the part and its shape. The injection molding process is versatile, and is used to produce a wide variety of quality parts, rapidly and economically.

LOW UNIT COST. Another positive value of injection-molded parts is the low cost of fabrication per part. While the initial cost of the mold itself is high, a mass-production operation makes the cost per piece low. Loss of molding material is generally low too.

NO FINISHING OPERATIONS. With good molding techniques, pieces can be injection-molded to close tolerances. In many cases, molded pieces require no finishing operations. Thus, large savings in time and expense can often be realized.

SIMPLIFIED DESIGNS. The versatility of injection molding often permits design simplification. Du Pont "Zytel" nylon, for example, can be injection-molded into intricate shapes, as well as around metal inserts. Du Pont "Alathon" polyethylene resin and "Lucite" acrylic resin can also be successfully injection-molded into a variety of useful forms. For more information about Du Pont engineering resin materials and how they are being used in industry, clip the coupon.

Turin Show

(*Continued from page* 106)

Working in conjunction with the Swiss Saurer Co., O.M. has produced a preselective electro-pneumatic transmission, which was shown attached to a 90 hp Diesel engine. This transmission is of the gear type with synchronizer clutches. The gear to be engaged is selected electrically and engagement takes place by compressed air. O.M. also had a one-piece welded chassis frame and body skeleton, receiving screwed-on light alloy panels. This had a longitudinally-mounted rear Diesel of 90 hp, combined with an eight-speed transmission. With a 173 in. wheelbase, dead weight was stated to be 7050 lb for a useful load-carrying capacity of 13,640 lb. This coach had engine exhaust braking. O.M. showed the only V-8 truck and coach motor in the show; this was a light-alloy unit built under Saurer license.

American chassis with Italian custom bodies occupied a certain amount of space at the show. Ghia produced a two-door, two-passenger coupe on a De Soto chassis. The appearance of length was accentuated by the very flat hood and a fillet which gave full width of vehicle from front to rear, the body sides tumbling home above and below this line. The top had a very long rearward slope and also with a view to lengthening effect the two breathers from the hood were thin, chromium plated strips, flush with the surface. No front bumper was fitted. A second Ghia production was a two-door sedan on a Chrysler chassis.

A most unusual body was one displayed by Bertone on an Alfa Romeo chassis. Stabilizing fins started from just behind the hood and continued to the rear, having a pronounced tumble home at their extremities. There was an air outlet for the front brakes and an air scoop for the rear brakes, the wheels being about three-quarter enclosed. Not only were bumpers dispensed with, but no headlights were fitted.

More Cores per Man Hour

(*Continued from page* 72)

Manual operations are limited to the placing of driers, loose pieces, and wires, and removal of cores. Both sections of the core box are mounted on platens supported on cradle arms at each station. Since this eliminates the usual bolting and unbolting, a complete box now can be changed in an average time of four minutes compared with 15 to 20 minutes on a conventional blower. Moreover, when a single box must be removed for maintenance, it can be quickly taken out while a limit switch is set to permit the machine to continue cycling at the other stations.

One of the major improvements incident to the adoption of this equipment has been an increase in blowing air pressure—from 100 psi to 135 psi while air volume has increased from 21 cu ft to about 26 cu ft per blow. Improved blowability has made it possible to raise moisture content of core sand with a simultaneous reduction in the use of bond, core oil, and core wires. In addition, it aids in producing denser, harder, and more clean cut cores.

To promote better management of core blowing operations, one of the machines has been arranged to handle cores for the cylinder block barrel and block jackets, and the cylinder head top and bottom jackets. The second machine handles the smaller cores—for intake and exhaust manifolds, water pump body, and rear retainer bore. Additional cores, most critical from the standpoint of quality and quantity, are being prepared for an extension of this list.

Production per man-hour on one of the machines—the first installed here—has increased from an average of 41 with conventional core blowers, to 104. On the second machine, production per man-hour has risen from an average of 103 with conventional core blowing methods, to 154.

Automatic core blowers have increased production per man-hour substantially; have improved core and casting quality from the standpoint of engineering requirements and appearance. There are other benefits but easily the most important are: the flexibility of the equipment; and its influence upon the simplification and standardization of core-making processes.

As may be anticipated, the introduction of this new equipment brought with it some new problems of in-

- for engine capacities from 135 to 600 lbs.-ft. torque
- single or double plate
- plate sizes from 9 to 17 inches

LONG

. . . for heavy-duty clutch requirements

Insistence upon the finest quality has been an inflexible practice at the Long Manufacturing Division for over 50 years. Long quality is proven with the millions of Long Clutches being road tested every day on cars, trucks, buses and tractors.

LONG MANUFACTURING DIVISION • BORG-WARNER CORPORATION

Detroit 12, Michigan, and Windsor, Ontario

CLUTCHES • RADIATORS • TORQUE CONVERTERS • OIL COOLERS

creased core box making and maintenance costs as well as machine downtime and repairs. However, these factors are overbalanced by the positive results and it is expected that with further experience the special problems will be solved satisfactorily.

Mold for Plastic Target

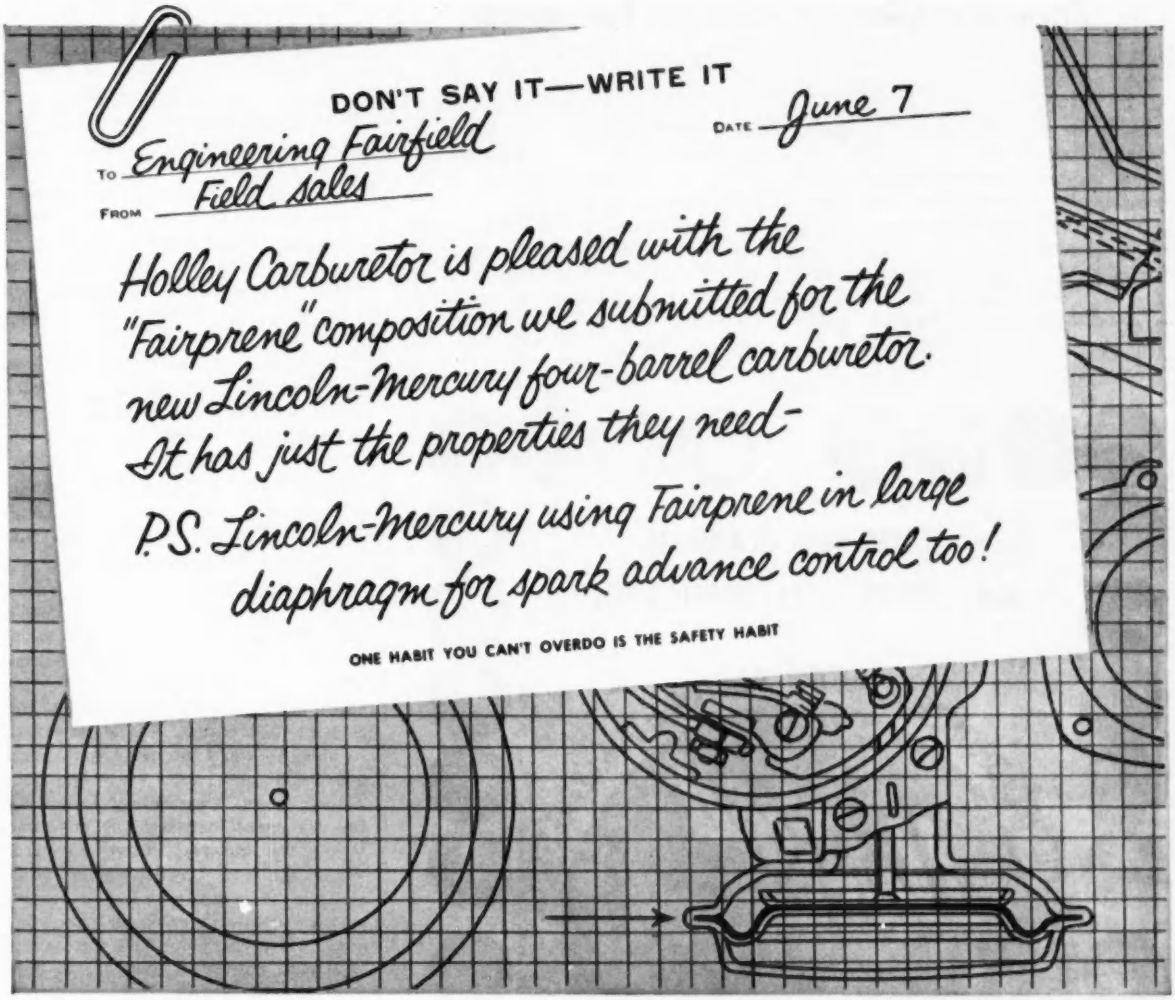
(*Continued from page* 100)

target is a relatively simple one. Simoniz wax is used as a parting agent to coat the mold before six layers of woven cloth are laid up by hand. Each layer is sprayed individually as it is laid up with a special polyester resin compound developed by Bellanca. The oven is then brought up to a temperature of about 250 F and held at that point for 20 minutes.

Once the oven has been turned off, a polyvinyl bag is brought over and sealed in place. Air is then evacuated from the bag to provide pressure on the laminated part. The bag is removed in 10 minutes or so, and the part is left to air cure for eight hours. After it has been taken out of the mold, the flash is sawed off, and edges are sanded. Holes are then drilled for the rivets to attach the halves, bulkheads, and other reinforcing members. A wood stringer is used in each of the fins for final assembly to maintain its structural form.

Bonding material, in addition to rivets, is used to attach the parts to obtain a molecular bond, prevent leakage, and maintain a clean aerodynamic surface. The finished unit requires few or no finishing operations other than three coats of paint.

While the plastic shell of the target with fins and stabilizer weighs 145 to 150 lb, this figure rises to 300 lb after the front end has been filled with shot to maintain proper weight distribution, electronic equipment installed, and a parachute added. Foamed plastic members are used in the fuselage so that the target cannot sink if shot down over water.



NEW, SALES-BUILDING FEATURES, like Lincoln-Mercury's vacuum-controlled 4-barrel carburetor and improved spark advance are just ideas until materials are engineered that make them practical.

The diaphragms used in these applications are cut and molded by Chicago Rawhide of a special Du Pont "Fairprene" compound. It is easy to mold, and extremely sensitive . . . has high flex life, heat resistance and resistance to premium gasolines and gasoline vapors.

Du Pont technicians are *always* ready to "tailor" the properties of "Fairprene" synthetic elastic compositions to fit a specific job. The general properties of "Fairprene" include toughness and flexibility as well as resistance to aging from exposure to air, kerosene and oil or grease—even at extreme temperatures. "Fairprene" comes in the form of sheet stocks, coated fabrics and adhesives. Among the many uses for "Fairprene" compositions are weather-stripping cements, bearing seals, gasketing and diaphragms.

For more information—or to ask Du Pont's technical staff to work with you in applying the properties of "Fairprene" to your requirements—fill in and mail the coupon today.

DU PONT FAIRPRENE®

synthetic elastic compositions

"ENGINEERED TO DO YOUR JOB BETTER"

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

* **"FAIRPRENE"** *is Du Pont's registered trade-mark for its line of products made from synthetic elastomers available in the form of coated fabrics, sheet stocks without fabric insert and adhesives.*

E. I. du Pont de Nemours & Co. (Inc.)
Fabrics Division, A. I., Fairfield, Conn.

☐ I am interested in Du Pont Technical Service.

☐ Please send me further information on "Fairprene" synthetic elastic compositions.

The application(s) I am interested in for "Fairprene" compositions include:_____

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

Studebaker Champion Automatic Transmission

(*Continued from page* 61)

gravity pawl stops the inward movement of the governor valve at the same position obtained by the inner stop on the old-style valve stop plate. (On the early model Commanders this pawl prevented a down-shift from direct drive to drive intermediate under heavy acceleration but permitted a down-shift in the kick-down position at speeds under approximately 60 mph and with closed throttle at approximately 15 mph.) This gravity pawl prevents down-shifting to low under any circumstances except when car speed is reduced to seven to nine mph or less and the *accelerator is released*. When the accelerator is released the control plunger moves forward and the ramp on the plunger operates the rocker arm which raises the gravity pawl. This permits the governor valve to move into its cylinder, when the car speed drops to approximately eight mph, closing off pressure to the multiple disk clutch and at the same time dumping the pressure in the clutch past the relieved portion of the governor valve. Note that the control plunger has a ramp on the back side of the rocker arm only. Since there is no ramp on the front side of the arm the gravity pawl remains in the lock-out position even with the plunger in the kick-down position.

Having provided for low-gear starts, better shift speeds were possible. The change in shift speeds was accomplished through the use of the Model H (Commander) governor spring.

Following are the operational changes that are present with this new low-start transmission:

When the shift lever is moved to the "D" position, only the forward band is applied. The governor valve is held into its cylinder, by the governor spring, in a position that prevents oil pressure from reaching the multiple disk clutch. As the car starts to move forward the drive is through gear reductions in the front and rear planetary sets and the converter. As the car speed increases the governor moves the governor valve outward. When the car speed reaches from eight to 35 mph, depending upon the position of the accelerator, the governor valve has moved outward sufficiently to permit oil pressure to flow to the multiple disk clutch, applying it. This eliminates the gear reduction from the front planetary set of gears. At the same time the ramp on the control plunger has moved rearward, off of the rocker arm, permitting the rocker arm spring to move the rocker arm out of contact with the gravity pawl and the pawl drops down to the lock-out position. As the car speed increases a shift from drive intermediate to drive direct is made the same as on previous models. Part throttle and kick-down downshifts, to drive intermediate, are accomplished in the same manner as on previous models. The downshift does not go to low because the gravity pawl stops the governor valve after it has moved inward sufficiently to shut off pressure to the direct drive clutch but before it has moved inward sufficiently to shut off pressure to the multiple disk clutch. However, if the accelerator is released, the control pawl will operate the rocker arm moving the gravity pawl up making it possible

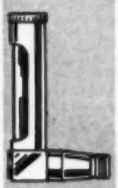
(*Turn to page* 118, *please*)

LOOK TO THE LEADER . . . FOR LUBRICATING DEVICES

GITS

40 YEARS' LEADERSHIP

Yes, for 40 years GITS has been setting the standard for industry . . . solving tough lubricating problems . . . earning the confidence of manufacturers . . . it's the reason people say, "Call GITS first".



LOW COST

Yes, GITS oil cups can do a complete lubricating job for you . . . prolonging bearing life, reducing maintenance costs, cutting down-time, boosting production . . . and GITS oil cups cost so little.

WORLD'S LARGEST SELECTION

Yes, only GITS can offer you such a wide range of standard stock sizes. From *just one* source you can get *all* lubrication devices in *any design* for *any purpose.*

CONSISTENT TOP QUALITY

Yes, GITS is known for uniform quality in design, materials and machining . . . this means constant, dependable performance for you. Inferior products can cost you time and money. Demand the best . . . get GITS.

Oil Hole Covers • Oil Cups • Grease Cups • Bottle Oilers • Gauges • Gravity-Feed • Wick-Feed Constant Level • Vibrating Rod Styles • Threaded or Drive-Type • Elbow or Straight

GITS BROS. MFG. CO.

1870 S. Kilbourn Ave. Chicago 23, Ill.

Write today for Free Catalog No. 60A. Use it as your handy reference for lubricating devices.

5 great machines... 1 big objective...

to cut your lapping costs

Here they are. Five outstanding lapping machines by Norton. Designed for single or multi-purpose — but all built to give you fastest, cleanest lapping performance at lowest possible operating cost.

Every second of operation, value is being added to the product through a finer, smoother, precise finish achieved in less time. This adds to your profit margin and to the ultimate user's satisfaction.

Whatever your needs there is the right Norton Lapping Machine to give you maximum output, minimum down-time; higher quality work and less dependence on manual skills.

Send for more complete information or submit samples of your work for correct lapping machine application and production. NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

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GRINDERS *and* LAPPERS

Making better products . . . to make other products better

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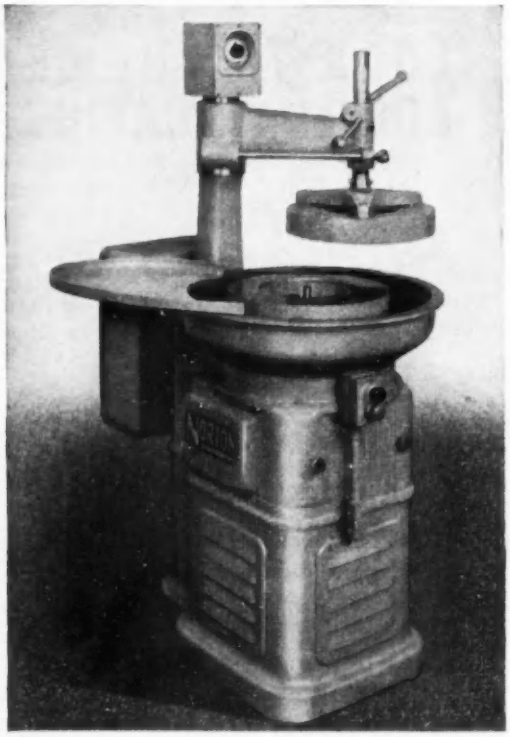
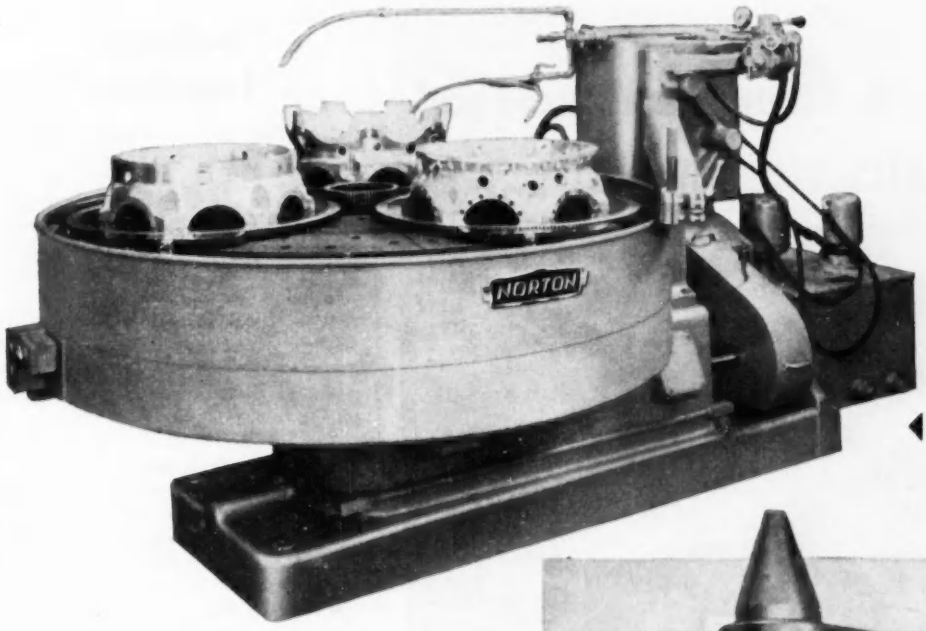


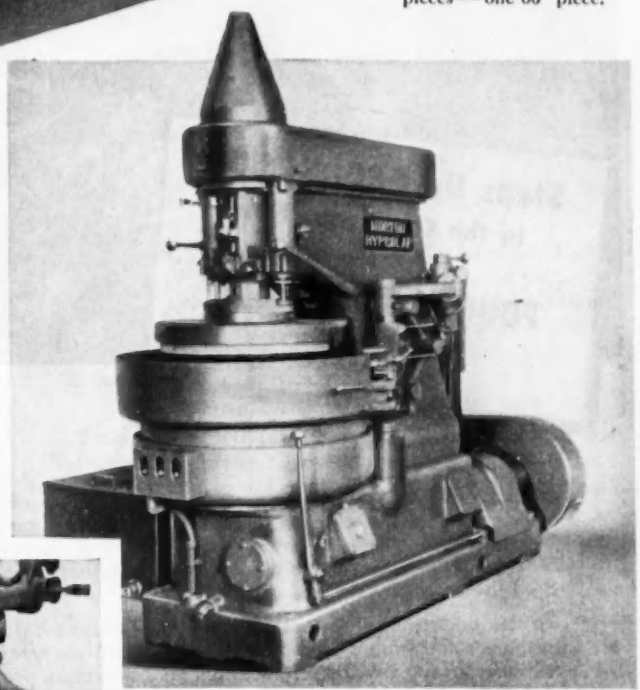
Vertical lapping machine type 16FC has outstanding production capacity in such work as diesel injector parts, plug gages, size blocks, the sides of rings, and rollers. It produces flat or cylindrical work to a high degree of dimensional accuracy, parallelism and finish. Work capacity: 3" x 5" flat and 3" diameter cylindrical.

Simplex surface finisher No. 12. A highly efficient machine which uses flexible coated abrasives. Ideal for handling small crankshafts for refrigerator compressors and outboard motors, eccentric and concentric cylindrical surfaces, journals and seal surfaces on many cylindrical parts. Work capacity: ½" to 2½" diameter; up to 12" length.

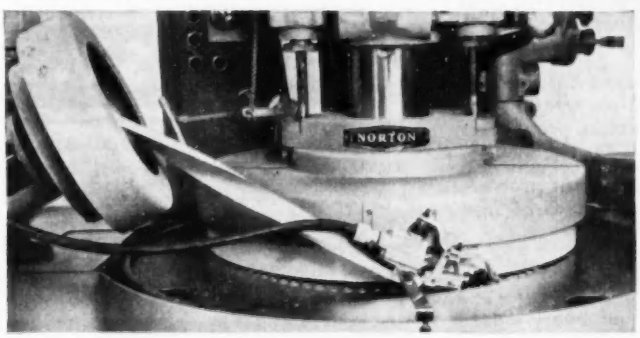


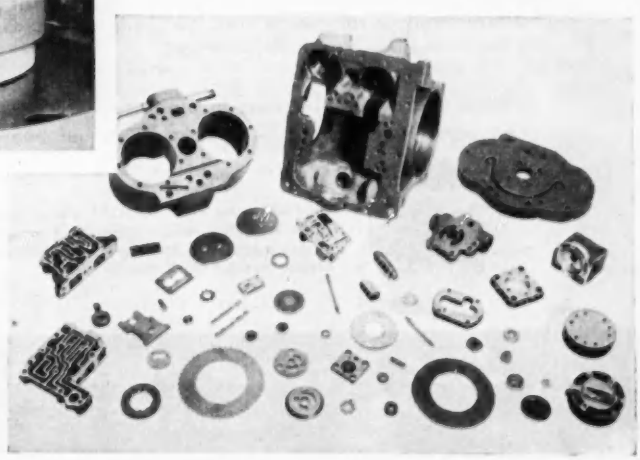
60″ single face flat lapping machine. Bonded abrasive laps make it a sensational performer, particularly on soft metals. It produces a clean finished surface free from imbedded grit. Provides seal surfaces, wear surfaces or flat surfaces for other machining operations. Hydraulic pressure device is available for light work; power-operated truing arm, loadless starting inertia-delay clutch. Capacity range, three 24″ pieces — one 60″ piece.

Hyprolap lapper No. 26. Extremely fast-cutting machine using bonded abrasive laps and filtered coolant. Finishes 20 or more work pieces simultaneously with a combination of accuracy and finish-uniformity otherwise unobtainable in mass production. Easy to operate. Lapping pressure is hydraulic powered and controlled — an exclusive Norton feature. Work capacity up to 3″ thickness or diameter, to 7½″ length.



Through-feed No. 26 Hyprolap machine. 4-to-1 savings proved on finishing small, flat parts. Handles small pieces up to 8,000 an hour. Loading and unloading are entirely automatic . . . less downtime for lap dressing because work path traverses the entire work surface of each lap. High worker skills are not needed. Work up to 1¼″ diameter. Modifications to handle larger work.





NORTON JOB LAPPING SERVICE

Improve your product quality by precision lapping. The new enlarged Norton Job Lapping Department is ready to finish parts to your exact specifications. Complete and modern in every detail, the new department is manned by personnel skilled in every type of lapping process. Jobs handled include flatwork up to 24″ across and cylindrical work from 1/16″ diameter by ½″ long to 2″ diameter by 8″ long, in practically every material. The best type of lapping for your requirements — with rapid stock removal and highest precision finishes — can be produced. See your Norton Representative for details, or write us direct.

Studebaker Transmission

(*Continued from page* 114)

for the governor valve to move inward. It will not move inward, however, due to the action of the governor, until the car speed is down to approximately eight mph.

When the down-shift to low is made there is no engine braking since the front planetary set will now free wheel at the reverse free wheel unit on the rear sun gear.

The low and forward brake cylinder cover has been changed to provide a double piston at the forward drive band. This change was necessary since with a low start all the torque, from the front and rear planetary sets, is applied to the rear sun gear which is held by the forward drive band. The low band is not applied for low start in the "D" range; therefore, the low drum tries to turn but it is prevented from turning by the reverse free wheel unit locking up on the rear sun gear. The rear sun gear is prevented from turning by the forward free wheel unit, drum, band and servo unit.

The low band must, however, be applied to provide effective engine braking in the "L" position. This characteristic is still retained.

All of the changes in the extension case and the low and forward servo cover are required to provide for low start in "D" range.

BOOKS...

HISTORY OF AMERICAN INDUSTRIAL SCIENCE, *by Courtney R. Hall, published by Library Publishers, 8 West 40th St., New York 18, N. Y. Price, $4.95.* This book gives timely recognition to the scientific revolution in American industry. While ample attention has been given to the historic development of industry, bold and original use of new industrial material has been made. This new material has been furnished by 60 of the leading corporations in America.

MECHANICS OF MATERIALS, *by Philip G. Laurson and William J. Cox, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $5.75.* This third edition retains much of the outlook of earlier editions. The most important changes are the increased emphasis on the statics of stress determination, and the postponement of the material on stresses determined by deformation. Other changes are: the revision of the tables of structural shapes; the inclusion of many new illustrations; and the addition of a whole series of new problems.

What Does Grain Size Mean In An Alloy Steel?

This is the third of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

The grain size of alloy steels is understood to mean austenitic or inherent grain size. Austenitic grain size should be distinguished from ferritic grain size, which is the size of the grains in the as-rolled or as-forged condition with the exception of those steels that are austenitic at room temperature. When steel is heated through the critical range (approximately 1350 to 1600 deg F for most steels, depending on the composition), transformation to austenite takes place. The austenite grains are extremely small when first formed, but grow in size as the temperature above the critical range is increased, and, to a limited extent, as the time is increased. It is apparent, therefore, that both time and temperature must be constant in order to obtain reproducible results.

When temperatures are raised materially above the critical range, different steels show wide variations in grain size, depending on the chemical composition and the deoxidation practice used in making the heat. Heats are customarily deoxidized with aluminum, ferrosilicon, or a combination of deoxidizing elements. Steels using aluminum or certain other deoxidizers in carefully-controlled amounts maintain a slow rate of grain growth at 1700 deg F, while heats finished with still other deoxidizers, usually ferrosilicon, develop relatively large austenitic grain size at temperatures somewhat below 1700 deg F.

The McQuaid-Ehn test is the one ordinarily used for determining grain size. Steel is rated with a set of eight ASTM charts that are compared one at a time with a specially-prepared steel sample until one is found to match. Number 1 grain size, the coarsest, shows 1½ grains per sq in. of steel area examined at 100 diameters magnification. The finest chart is Number 8, which shows 96 or more grains per sq in. at the same magnification.

PROPERTIES AFFECTED BY GRAIN SIZE

Fine-grain steels (grain sizes 5, 6, 7, and 8) do not harden as deeply as coarse-grain steels, and they have less tendency to crack during heat-treatment. Fine-grain steels exhibit greater toughness and shock-resistance—properties that make them suitable for applications involving moving loads and high impact. Practically all alloy steels are produced with fine-grain structures.

Coarse-grain steels exhibit definite machining superiority. For this reason a few parts which are intricately machined are made to coarse-grain practice.

The correct specification and determination of grain structure in steel is a subject that has been given long study by Bethlehem metallurgists. If you would like suggestions on this or any other problem concerning alloy steels, these men will be glad to give you all possible help.

In addition to manufacturing the entire range of AISI alloy steels, Bethlehem produces special-analysis steels and the full range of carbon grades.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL

CALENDAR

OF COMING SHOWS AND MEETINGS

Canadian International Trade Fair, Toronto, Canada ....May 31-June 11

American Gear Manufacturers Association, annual meeting, Hot Springs, Va.....June 6-8

SAE Summer Meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. .....June 6-11

AMA Conference On Collective Bargaining, Hotel Astor, New York, N. Y. .....June 7-8

Society of the Plastics Industry, Sixth National Exposition, Cleveland, O. .....June 7-11

American Society for Quality Control, annual convention, Jefferson Hotel, St. Louis, Mo....June 9-11

Le Mans 24-Hour Race, Le Mans, France .....June 12-13

American Society for Testing Materials, annual meeting, Sherman Hotel, Chicago, Ill. .....June 13-18

AIEE Summer and Pacific General Meeting, Hotel Biltmore, Los Angeles, Calif. .....June 17-21

National Metal Trades Association, plant management conference, French Lick, Ind. .....June 20-23

AMA General Management Conference, Hotel Statler, New York, N. Y. .....June 21-23

IAS Summer Meeting, Los Angeles, Calif. .....June 21-24

American Helicopter Society, tenth annual forum, Mayflower Hotel, Washington, D. C. .....June 24-26

Truck, Trailer, and Equipment Show, Los Angeles, Calif. ..June 24-27

Western Plant Maintenance Show, Los Angeles, Calif. .....July 13-15

SAE West Coast Meeting, Los Angeles, Calif. .....Aug. 16-18

Leipzig Trade Fair, Leipzig, Germany .....Sept. 5-15

Society of British Aircraft Constructors, exhibition and flying display, Farnborough, England Sept. 7-12

National Fluid Power Association, fall meeting, Hotel Commodore, New York, N. Y.....Sept. 7-9

SAE National Tractor Meeting, Hotel Schroeder, Milwaukee, Wis. Sept. 13-16

First International Instrument Congress and Exposition, Philadelphia, Pa. .....Sept. 13-24

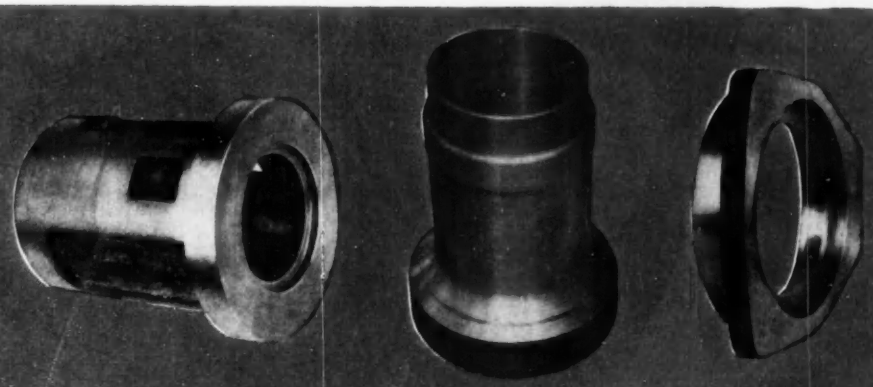
Fourth European Machine Tool Exhibition, Milan, Italy.....Sept. 14-23

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 15-17

Society for Experimental Stress Analysis, annual meeting and exhibition, Bellevue-Stratford Hotel, Philadelphia, Pa. ..Sept. 21-23

National Industrial Packaging and Materials Handling Exposition, Chicago, Ill. .....Sept. 28-30

big production jumps such as these actual jobs...



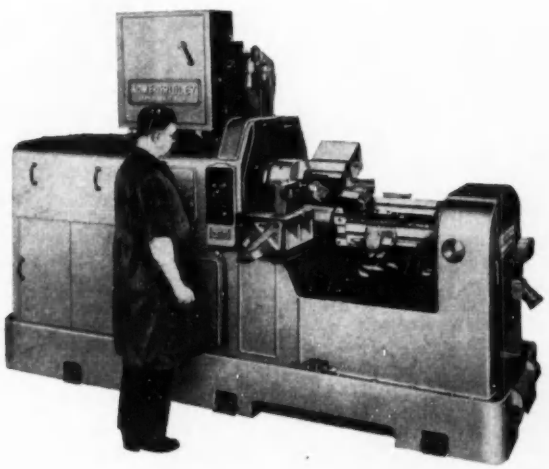
	FINGER HOLDER BODY 6⅝" dia. Semi-steel	SEMI-FINISHED COLLET 5⅞" dia. 4160 steel	BEARING RETAINER 9¼" dia. Lumen alloy
Former Method	39. 2 minutes	65 minutes	17.3 minutes
Model MC Time	11.2 minutes	13 minutes	6.0 minutes

can be made ONLY on the brand new

12"-UNIVERSAL

MODEL MC ACME-GRIDLEY

Single Spindle Automatic Chuckers



General claims about this or any other new model machine can be facts BUT every experienced shop executive knows that only a comparison of specific net gains of new methods over old can justify his serious investigation.

For this reason we emphasize the unprecedented production gains on 3 chucking jobs, typical of the kind of time savings realized since we announced the new Acme-Gridley 12" Universal Single Spindle Chucker a year ago.

If you believe that similar facts on your particular chucking problems are worth your making such a comparison and if you are willing to be surprised by similar gains, guaranteed, your next move is to call in our engineers. General bulletin MC53 tells all about the design advantages.

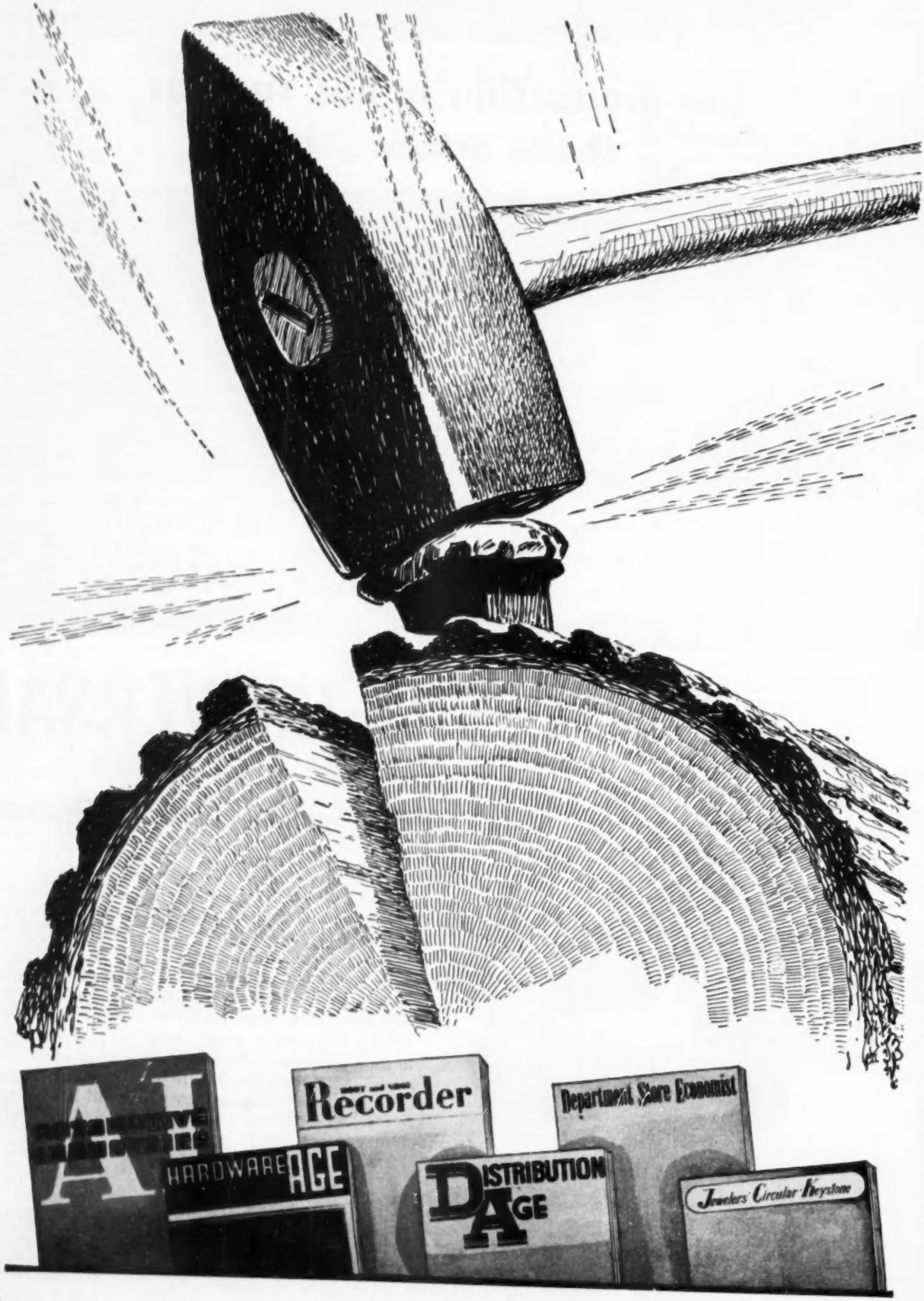
You can't do TODAY'S job with YESTERDAY'S tools— and be in business TOMORROW.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS

1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing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HARDWARE AGE
DISTRIBUTION AGE
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PENETRATION

that reaches those who do the buying

Editorial excellence . . . *quality* circulation. These are the "tools" with which Chilton publications penetrate deep into the fields they serve to influence those who do the buying.

How best to serve his readers is the first concern of every Chilton editor. He sets stern standards of editorial conduct, and the result is an important advantage to Chilton advertisers—sustained reader interest. And Chilton makes the most of this by selecting readers under the most rigid regulations to make certain the advertiser's message reaches those who make the buying decisions.

It's this combination of editorial excellence and *quality* circulation that makes Chilton publications a dynamic power that penetrates deep into the fields Chilton serves to move goods and sell services.

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NBP

Bendix Builds a Better *cable clamp* the AN3057B

Inexpensive • Efficient • Versatile

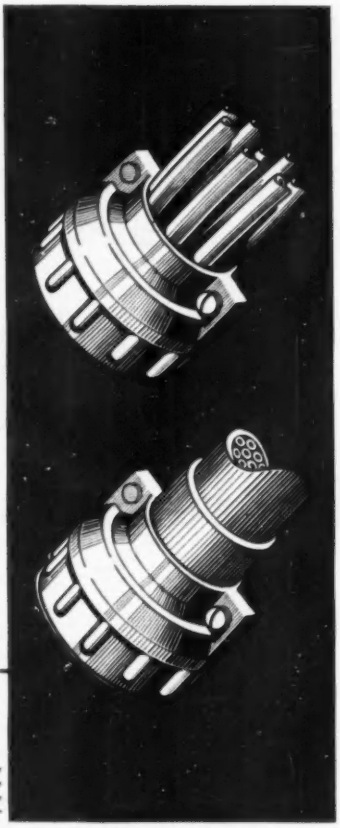
The new Bendix AN approved AN3057B cable clamp is now available. Engineered by Bendix to the highest quality standards, this cable clamp offers major design improvements. The clamping action is radial and completely eliminates wire strain and chafing by holding the wire bundle firmly in rubber. This clamp will accommodate a wide range of wire bundle sizes, but an even greater range can be handled through the use of the Bendix AN3420A accessory telescoping sleeve.

The new AN3057B cable clamp will also waterproof multi-conductor rubber covered cable on the rear of a connector, or where moisture-proof entrance through a bulkhead or into an equipment box is required.

This versatile clamp is a product of the Scintilla Magneto Division of Bendix Aviation Corporation and is a companion AN accessory to the world famous Bendix Scinflex line of electrical connectors. Write our Sales Department for details.

Outstanding Features

- Neoprene gland.
- Centered clamping action.
- Increased close down.
- Positive grounding feature.
- Cadmium plated die-cast aluminum nut.
- Shorter over-all length.
- Waterproofs multi-conductor cable.
- Immediate delivery.



Bendix

SCINTILLA DIVISION of Bendix AVIATION CORPORATION
SIDNEY, NEW YORK

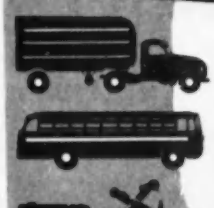
FACTORY BRANCH OFFICES: 117 E. Providencia Ave., Burbank, Calif. • American Bldg., 4 S. Main St., Dayton 2, Ohio • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Michigan • 512 West Ave., Jenkintown, Pa. • Brouwer Bldg., 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 8401 Cedar Springs Rd., Dallas 19, Texas • EXPORT SALES: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

FOR 74 YEARS

TUTHILL

HAS SOLVED MANY EQUIPMENT PROBLEMS REQUIRING SPECIAL

SPRINGS



Since 1880 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, trailers, farm wagons or dual and triple axle heavy-duty jobs — Tuthill can meet them quickly and economically. And now, MOLYBDENUM DISULPHIDE (MoS_2) . . . the newest Tuthill extra that keeps springs from squeaking and galling, is an added Tuthill feature that distinguishes this famous line.

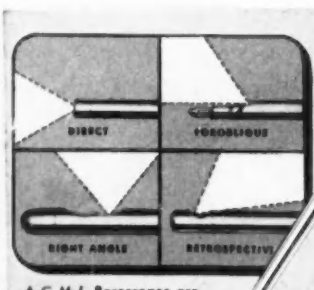
Whatever your spring requirements may be — see Tuthill first!

TUTHILL SPRING CO.

760 West Polk Street Chicago 7, Illinois

A.C.M.I. BORESCOPES

for close-up visual inspection of internal surfaces and hidden parts



A.C.M.I. Borescopes are available in 4 angles of vision (as above)—in diameters of .120" to 4.00" —in lengths of 4" to 720". Special models for special problems.

A.C.M.I. Borescopes permit close-up visual examination of interior areas and surfaces not otherwise visible. They save time and money, and prevent costly dismantling. • Each Borescope is a compact, self-illuminated industrial telescope of highest quality, employing a precision optical system, that produces a flat visual field. Lens systems are fully corrected for color, spherical aberrations, and coma, with all lens surfaces coated to increase light transmission

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ON OUR WASHINGTON WIRE

Actual construction of the St. Lawrence seaway is expected to get under way within the next 60 days. An immediate start on both the navigational and hydroelectric power aspects of the project is anticipated in Washington.

The new Federal-Aid Highway Act authorizes a two-year total of $1.932 billion. The provision of $875 million for apportionment among the states for each of the fiscal years beginning in 1955-56 will make possible the biggest Federal highway program in history.

Recognition of the importance of research and development work has been accorded through expansion of the base by which new laboratories are accorded Federal tax amortization certificates. Such laboratories will rate as eligible if they are being established in connection with an industry product or service which in itself is under an expansion goal.

Forthcoming studies by Army, Navy, and Air Force are expected to turn up ways of ending competition between military-operated facilities and private business. The three services must begin immediately to examine the need, if any, of military sponsorship of industrial-type operations and establishments which provide both services and end products.

Many military uses are being forecast for a new synthetic rubber developed jointly by industry and the Army. Basically a fluorocarbon elastomer, the synthetic may be used in tank linings, fuel hose, gaskets, seals, and coatings for protective clothing. It also could serve in the treating or coating of metal, fabric, wood, or paper, according to reports.

SHORTIES

The U.S. has more than three-quarters of the world's passenger cars, and more than half its trucks and buses.

•

One electronic system in a modern guided missile, now under development, is capable of "thinking" at a rate 10,000 times the speed of the human brain.

•

Last year, control towers of the Civil Aeronautics Administration handled an average of one-take-off or landing every two seconds.

•

In the ordinary passenger car there are over 15,000 different parts.

•

Modern fighter pilots wear outfits and accessories weighing 144 lb.

•

To gear a single new aircraft plant for production of a high-performance jet fighter, it takes two years and 8.4 million man-hours.

•

In 500 hours of flying on 47 simulated missions, one jet bomber recently covered mileage equivalent to nearly nine times around the world.

•

A jet transport now on U. S. drawing boards could carry 33,000 passengers a year between Europe and America.

•

Refrigerating units in a typical jet plane must be able to take a searing 600 F blast of air from the engine and deliver it to destination in a split second, at 20 F.

•

At the speed of sound, a pilot would have to exert 57000 lb of pressure on a modern fighter's control stick to overcome airstream forces, if the plane weren't equipped with a hydraulic boost system.

Wonder chemical

CHANGES METAL SURFACES, MAKES PAINTED PRODUCTS *look better longer*

NOT ALL "wonder chemicals" are new! Here's one that for more than a score of years has been doing a job that manufacturers at first said couldn't be done.

In as little as sixty seconds, Bonderite changes the surface of metal parts to a *nonmetallic* layer of unusual properties. Bonderite is used on automobile bodies, refrigerator cabinets, transformers, hardware, and metal furniture, to name a few items out of thousands.

This nonmetallic coating does several amazing things. Because it has an affinity for organic coatings and is integral with the metal, it takes and holds paint securely, preventing chipping and peeling. It acts to keep moisture from reaching the metal, thus controlling rust and corrosion. And should the paint film be damaged by accidental scratch or dent, Bonderite prevents the spread of finish failure.

All of these benefits combine to mean lasting fine appearance for those thousands of products whose manufacturers use Bonderite before painting.

Unlike many "wonder chemicals," Bonderite requires no special handling. It produces excellent results in large and small installations, in spray and immersion applications, and on steel, aluminum, zinc, or cadmium and their alloys.

The cost of Bonderite is small—a fraction of a cent per square foot of area treated—and the benefits are great.

Your inquiry will get prompt, expert, helpful attention.

*Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.

Parker

RUST PROOF COMPANY

2178 East Milwaukee, Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces

OBSERVATIONS

(*Continued from page 94*)

supplant the lubes now available. Objections to present lubes, voiced by forging experts at the recent SAE meeting, are that they are dirty, create smoke, and are difficult to remove. What is needed is something that works as well but is clean and smokeless.

Power Steer

We have confirmation from a second source that several manufacturers of power steering gear are grooming simplified versions of integral gears, said to be lighter, extremely simple and compact in design, and expected to compete with linkage booster gears on a price basis. Meanwhile, installations are growing on heavy-duty trucks. Bendix-Westinghouse recently announced its air-power booster steering gear for trucks and buses. And we hear that a Detroit area manufacturer has been thinking about an electrical power steering system. All in all, there is a lot going on and some striking developments are bound to appear in the next two years at the most.

Cylinder Block Inspection

(*Continued from page 59*)

capable of processing up to 200 blocks per hour. When the operation is completed, the workpiece moves into another Ingersoll cam and crank boring machine. This machine utilizes 10 stations and is of the transfer type. At this point of manufacture, crank holes are finish bored and the camshaft babbit bearings are finish bored. Too, the rear end of the block is finish faced, dowel holes are reamed, and holes required for the distributor are finished. Again, before the product leaves the machine, a variety of gages are used for quality measures.

Sheffield Precisionaries have been installed for inspecting the camshaft and crankshaft bores. Each main bearing bore is identified with a spot of color — red is used for bores ranging from 2.6912 to 2.6916 in. and bores from 2.6916 to 2.6920 in. are marked in green.

The blocks then travel by automation to a special LaPointe tunnel type broach which is used for finish broaching the top banks to size. An air gage is incorporated in the machine tool for checking the height and parallelism of the cylinder banks in relation to the locating lugs and end crankshaft bores.

For the next-to-last metal removal operation, a special Ex-Cell-O transfer type boring machine has been installed. Two blocks are loaded into the machine simultaneously, and the machine tool finish bores the 16 cylinders at one time. The diameter of the cylinders when finished ranges from 3.6235 to 3.6245 in.

Then for the final machining phase, the cylinders are honed in a three-station Barnes machine with Micromatic spindles. The bores are honed to a surface finish of from 20 to 35 microinches. Each cylinder is subsequently checked and stamped according to its diameter—i.e. grade 1 bore diameter 3.6250 to 3.6253 in., grade 2 bore diameter 3.6253 to 3.6256 in., etc., up to eight grades. In order to keep the coolant used during the honing operation at the proper working temperature, a central system to filter and cool has been installed along with the Micromatic machines.

A Centri-Spray washer cleans off the blocks preparatory to the insertion of the five cup type plugs — one in the rear camshaft hole and four in the sides of the block. This is done in a six station transfer machine made by Kent-Owens. Next, the workpiece is air tested for leaks in a Lee three-station machine. A Kruger Barnes flushing machine is utilized for cleaning out the oil lines. This procedure is carried out at an extremely rapid rate since one machine handles both block production lines.

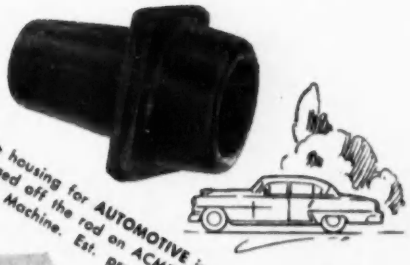
Finally, the block goes through the last inspection before proceeding to the assembly line.

New Self-Firing Unit Developed for Planes

A new fire control system, said to be capable of guiding a supersonic plane toward an enemy aircraft and "locking" it to get the correct firing point, has been developed by General Electric Co.

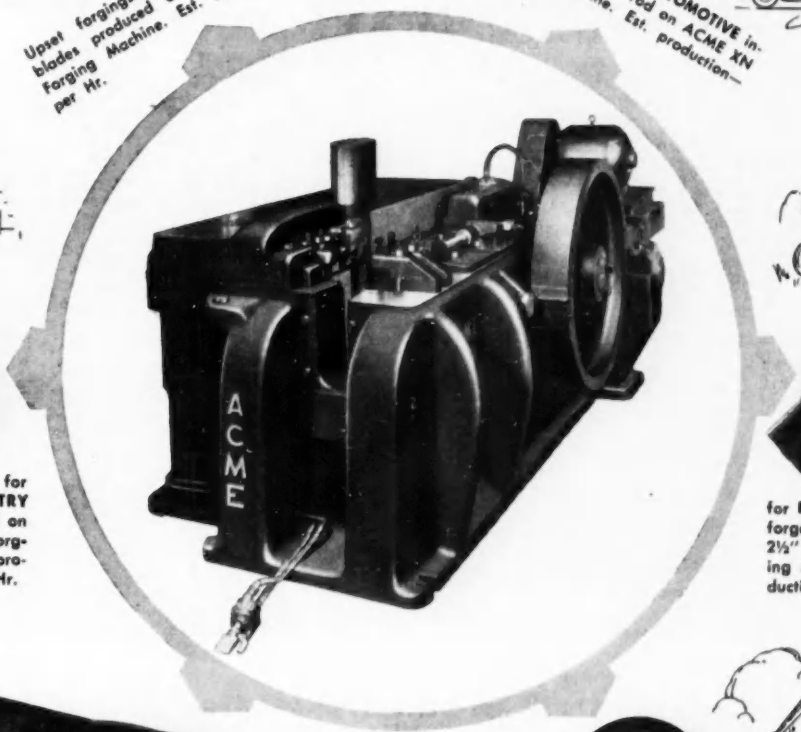
Once the plane's radar scope indicates the enemy's relative position, his course, and speed, the pilot turns control of the plane over to the automatic device. After locking on the enemy plane, the unit automatically fires the guns and guides the plane out of danger.

Upset forgings for **AVIATION** "Jet" blades produced on 1½" ACME XN Forging Machine. Est. production—200 per Hr.

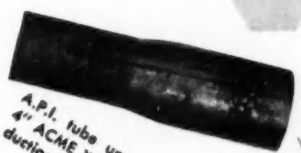


Rear axle housing for **AUTOMOTIVE** industry forged off the rod on ACME XN 3" Forging Machine. Est. production—240 per Hr.

Bevel gear blank for **GENERAL INDUSTRY** forged off the rod on a 3" ACME XN Forging Machine. Est. production—250 per Hr.



Heavy clevis for **FARM MACHINERY** forged on the rod with 2½" ACME XN Forging Machine. Est. production—265 per Hr.



A.P.I. tube upset for **OIL FIELDS** from 4" ACME XN Forging Machine. Est. production—300 per Hr.

Rail anchor for **RAILROADS** forged off the bar on a 2" ACME XN Forging Machine. Est. production—550 per Hr.

...and for YOUR Business Also!

The above production figures on forged parts from ACME XN Forging Machines may suggest cost savings to you in YOUR business. Our seventy-five years of experience is always available. Your inquiry will receive our immediate attention.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**

ESTABLISHED 1882

"ACME" FORGING • TEREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

The Greatest Sales Help at Your Command

In the automobile business, the very basis of sales management is the Polk official car owners registration list.

Sales managers who know from old-time experience how to get profitable sales volume in a buyer's market are again emphasizing intelligent and persistent use of the registration list as the foundation of their sales training activities.

More than at any other time since you have had post-war cars to sell, it is important to keep your car owners registration list up to date. It is the greatest sales help at your command.

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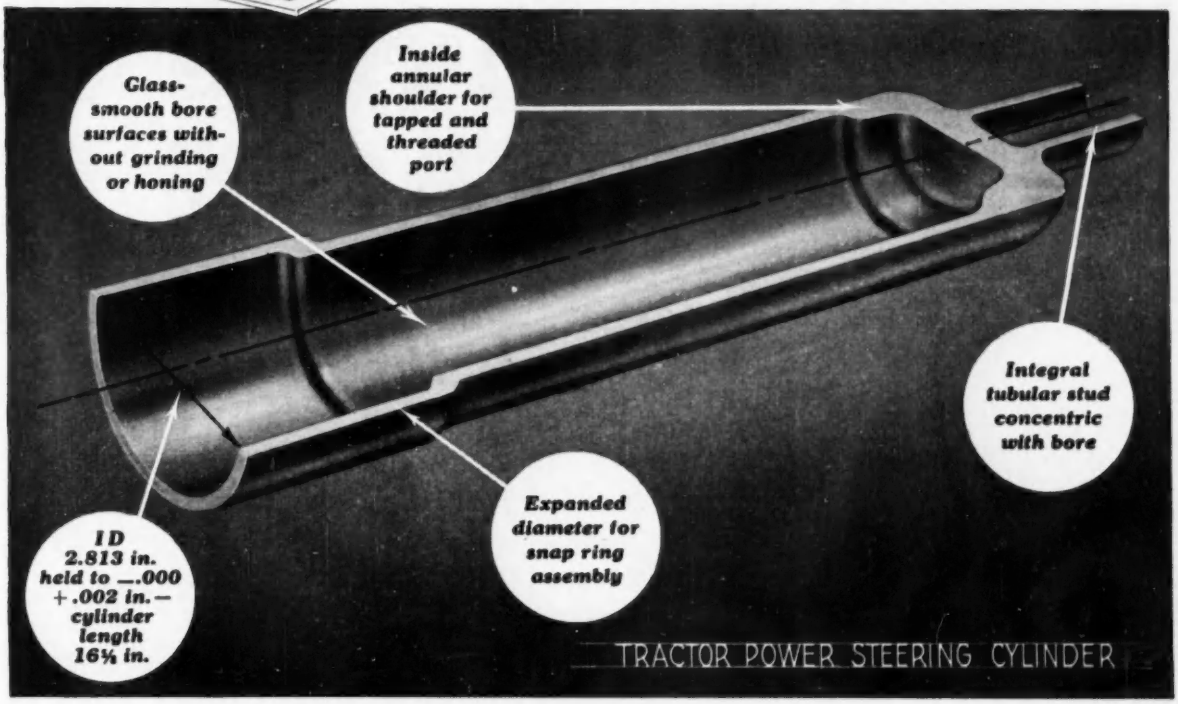
Now **Mullins Koldflo** *makes your dream design* **practical**



High quality special features at low cost—and...

Mullins *Koldflo* extrudes this finished part in one piece... *without machining*

- **You can now design intricate steel parts the way you want them—without compromise**
- **You can add important new sales features**
- **And Mullins Koldflo design cuts your costs**

NOW the designer's "idea horizon" is unlimited! This revolutionary new Mullins *Koldflo* process makes it *simple* and *practical* to design precision parts that were formerly too costly to consider. Call your nearest Mullins office and an experienced Mullins *Koldflo* sales engineer will help you design parts that can be mass produced by the Mullins *Koldflo** process! Write for booklet *"How would you tool-up to make an egg?"*

*Trade-Mark

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Phone—Diamond 1-1490

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Koldflo
DIVISION
MULLINS MANUFACTURING CORPORATION
Salem, Ohio

Phone—Salem 8771

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Inset shows radiator shaking machine used early in the original development stages of engine cooling radiators by present Young engineers and executives. Modern vibration machines have assisted Young in developing the strongest Radiator structure known.

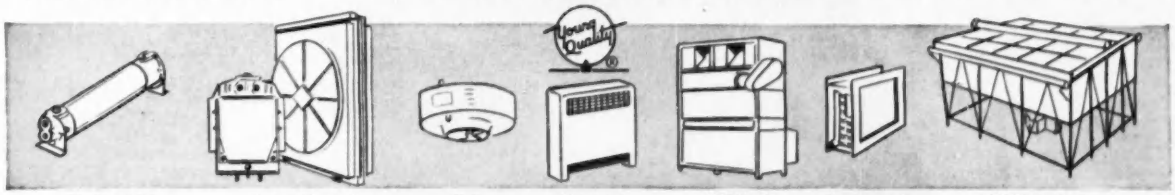
Daily poundings from rough, broken terrain, high speeds, big loads, and high and low temperatures are a few of the stresses and strains Young Radiators must withstand. Young Radiators have been designed to take "in their stride" such torsional stress and sudden shifts of mass. These unusually rugged, high-strength Radiators were developed, in part, from Young laboratory shaking machines capable of duplicating the most rigorous conditions imaginable. Test Radiators filled with water, and pressure-capped at 8-10 psi, are vibrated up to 1600 cycles per minute! From such tests have come Young-engineered vibration control mountings, restraining core side baffles, corner web reinforcing and many other stiffening structures that add extra life to the unit. Write today for further details on Young Radiators for improved heat transfer; there is no obligation.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 104-F, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.



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how high is up?

"Up" is the way production must go to offset constantly growing manufacturing costs.

Don't expect your men operating obsolescent equipment to increase your production through sheer physical effort.

Like many other Lodge & Shipley Lathe owners—you, too, can achieve new heights of productivity with the tireless accuracy of these advance-design Lathes.

Consult your local Lodge & Shipley representative or write us for a file of case histories. **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio**

Lodge & Shipley

....your LODGE-*ical choice!*

MODEL "X" LATHES
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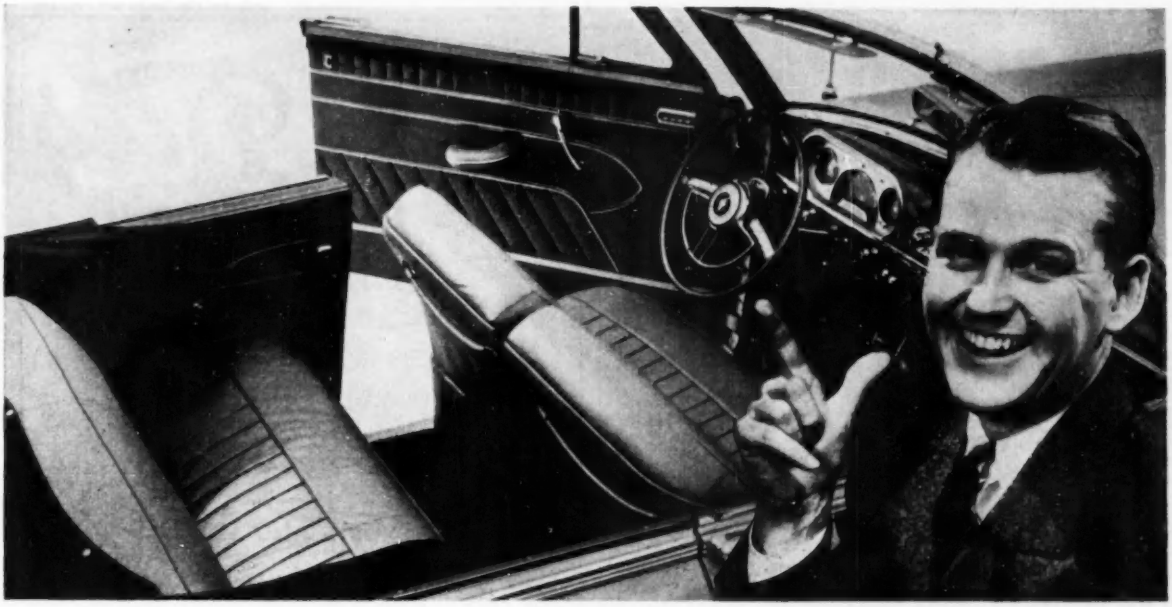
- TOOLMAKER
- MANUFACTURING
- GAP
- OIL COUNTRY

COPYMATIC LATHES
DUAL TRACER LATHES
DUOMATIC LATHES
T LATHES



genuine Leather

offers more value to car buyers

. . . more profit to you

● Leather, first choice of stylists for fine car interiors, is the best choice *any* car buyer can make. For nothing can match its beauty, durability and practicality. Costing only slightly more than good seat covers, genuine upholstery leather gives far more value to buyers and added profit on every sale to *you*.

Genuine upholstery leather is the logical material for car interiors because it resists hot sunlight and bad weather . . . tearing, fading and hard wear. Leather is easy to "slide" on—easy to care for—comes clean with ordinary soap and water. Its colors and finishes offer a choice that meets any style demand. And don't forget!—genuine upholstery leather actually *improves* with age and use . . . takes on a rich patina unduplicated in any other material . . . increases the trade-in and resale value of any car, an important consideration to all car buyers.

No substitute can add so much extra value to a car for so little. No other material can offer you the added profit of genuine upholstery leather. Why sell anything less?

WRITE FOR THESE SALES-TIPS

The new, free booklet, "All About Genuine Upholstery Leather," is yours for the asking. It contains some facts about leather that will convince you and your customers that genuine upholstery leather is the best buy in any car. Write for it today. There's no obligation.

Only Genuine Upholstery Leather Wears as Well as It Looks

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* THE ASHTABULA HIDE & LEATHER CO., Ashtabula, Ohio
* BLANCHARD BRO. & LANE, Newark, N. J.
* EAGLE-OTTAWA LEATHER CO., Grand Haven, Mich.
* GARDEN STATE TANNING, INC., Pine Grove, Pa.
  GOOD BROS. LEATHER CO., Newark, N. J.
* THE LACKAWANNA LEATHER CO., Hackettstown, N. J.
* RADEL LEATHER MANUFACTURING CO., Newark, N. J.
  RASER TANNING CO., Ashtabula, Ohio
* Suppliers of finished leather.

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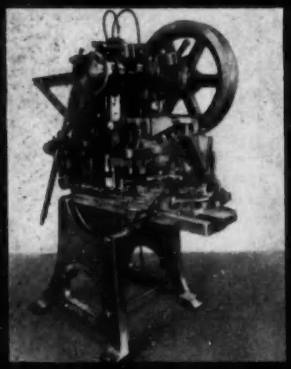
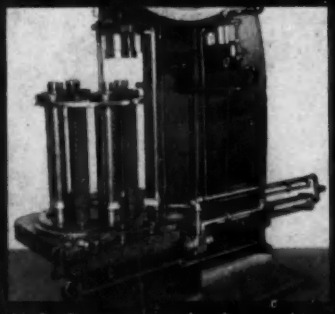
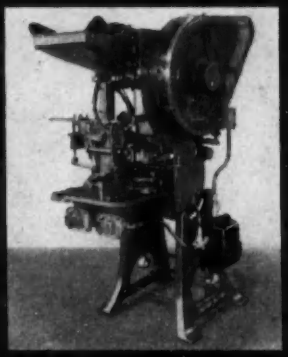


V & O has the sturdiness that makes automation practical.



V & O can provide the working height that automation may need.



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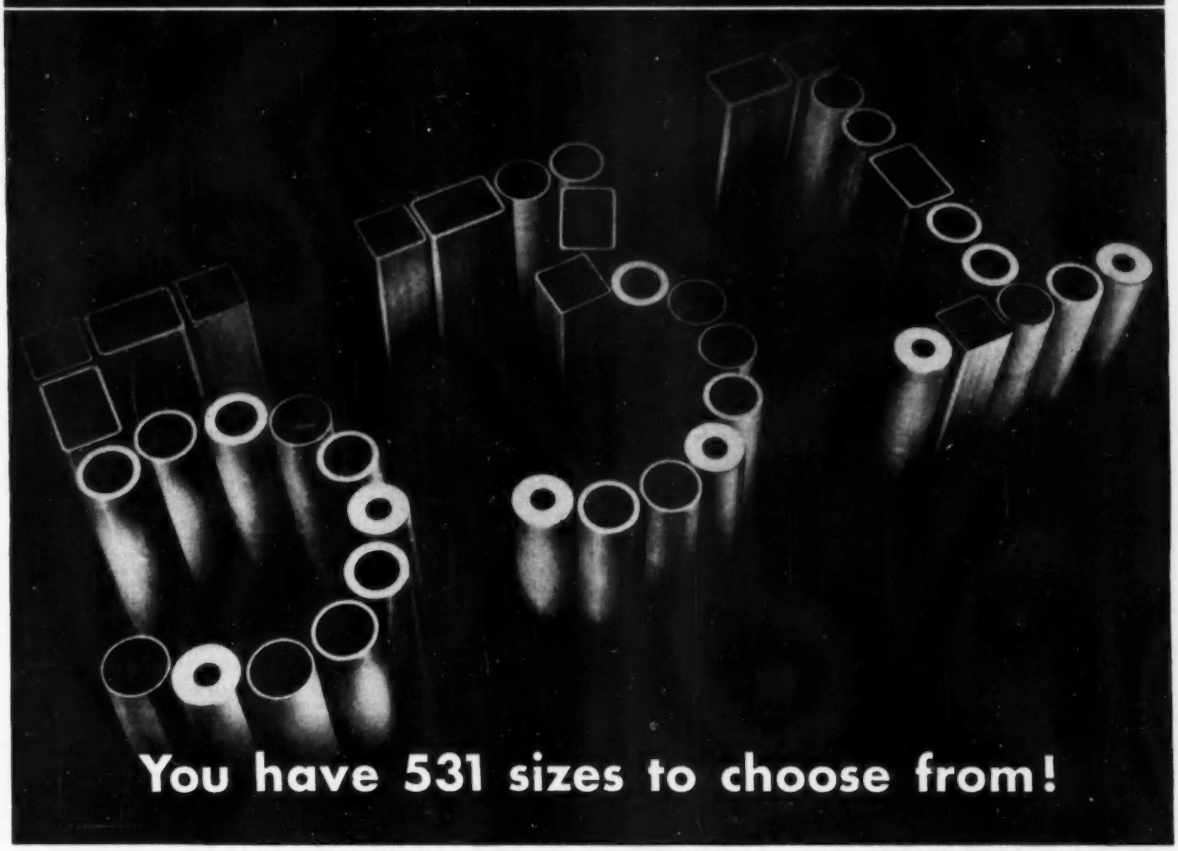

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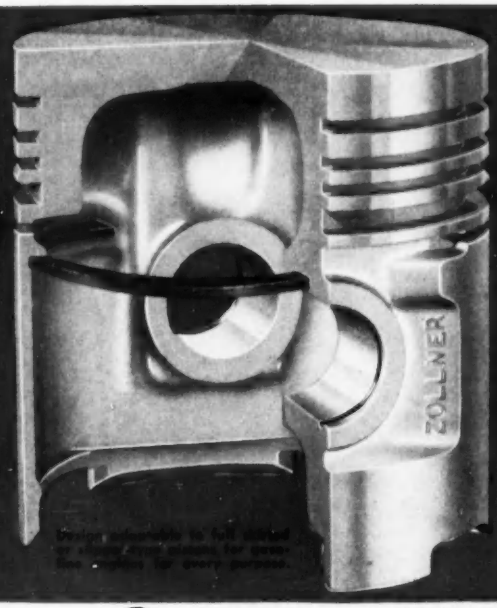

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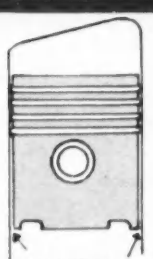

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